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ASSOCIATION BETWEEN BLOOD GROUPS AND ODONTOGENIC LESIONS: A PRELIMINARY REPORT

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ABSTRACT

Introduction: Blood type is a genetic characteristic that is related to some diseases and deformities. The diverse characteristics of pathological lesions complicate the prediction of genetic pattern of a specific cyst or tumor. Nevertheless, epidemiological evaluations can reveal relationships between some lesions or accompanying diseases as well as some genetic characteristics of the patient. These associations will help to guide the identification and treatment of lesions.

Objectives: This study aimed to evaluate the relationship between blood groups and the incidence of odontogenic cysts and tumors.

Material and methods: Simple random sampling was performed in this retrospective study. A total of 129 cases that were histopathologically diagnosed with a radicular cyst, odontogenic keratocyst, dentigerous cyst, or ameloblastoma, between 2005 and 2016 with complete data were evaluated.

Results: Among 129 cases, 76 (58.9%) and 53 (41.1%) cases were male and female, respectively. Among all cases, 51 (39.5%), 38 (29.4%), 22 (17.1%), and 18 (14%) had O, A, B, or AB blood types, respectively. Among these cases, 47 (36.4%), 39 (30.2%), 22 (17.1%), and 21 (16.3) had a dentigerous cyst, odontogenic keratocyst, radicular cyst, or ameloblastoma, respectively.

Conclusions: Blood groups "B" and "AB" are associated with a high incidence of odontogenic lesions and dentigerous cysts.

Key words: blood group, odontogenic, dentigerous.

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INTRODUCTION

There are some pathological problems related to oral tissues. Cysts and tumors of the jaw are common clinical and pathological findings, and are classified as odontogenic or non-odontogenic on the basis of their origins. Studies on these cysts and tumors are highly valuable given their aggressive behavioral pattern and difficult

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diagnosis [1-5]. Odontogenic keratocysts (OKCs) results from a proliferation of epithelial dental lamina in both jaws. OKCs are mostly benign lesions with aggressive behavior and present a typical alveolar bulge as they expand along the jaw. Although these lesions can expand the jaw, they are usually asymptomatic and are discovered through an incidental radiographic image, as they mainly expand in the anteroposterior dimension [14]. Radicular cysts have an inflammatory origin and develop either from the epithelial remnants in the periodontal space or from a necrosed pulp. These lesions cannot be easily identified given their small size, and are frequently discovered as an incidental finding through routine radiographic examinations [6, 7]. Ameloblastomas are tumors with an odontogenic source that originates from epithelial deposits of the tooth germ, stratified squamous epithelium of odontogenic cysts, and epithelium of enamel organ. Ameloblastomas are a clinically aggressive odontogenic tumor (ameloblastomas without histopathological features of malignancy are clinically considered as locally malignant), that grow slowly without any expansion, therefore, remain an asymptomatic most of the time [8, 9]. Dentigerous cysts originate through the separation of the follicle from the crown of an unerupted tooth. They are generally associated with the crowns of impacted or unerupted permanent teeth, but they may also be associated with an odontoma, developing teeth, and even deciduous teeth [10]. Patients with dentigerous cysts are mostly asymptomatic in early stages and exhibit no painful symptoms unless in presence of an acute inflammatory exacerbation; thus, these lesions are often detected incidentally during routine radiographic examination [11]. The diverse characteristics of these lesions complicate the prediction of a specific pattern for the pathogenesis of maxillofacial lesions. Nevertheless, epidemiological evaluations can reveal relationships between some lesions or accompanying diseases and some genetic characteristics of the patient. These associations will help to guide the identification and treatment of lesions. The ABO blood group system was established by the Austrian scientist Karl Landsteiner at the University of Vienna in 1901. The ABO locus is present on chromosome 9q34, and the *ABO* gene is autosomal. Different blood groups have various distributions among countries and ethnicities. Among all blood types, the O blood type is the most prevalent blood type, whereas the AB blood type is the least predominant [12-14].

Certain blood types are associated with some diseases, including hepatitis B [15], vascular diseases, abdominal aortic aneurism, gastric and duodenal ulcer, and cancers [16].

OBJECTIVES

In the present study, we evaluated the relationship between ABO blood groups and odontogenic lesions in patients to address the lack of coherent and adequate researches on this topic.

MATERIAL AND METHODS

This study was approved by the Shiraz University of Medical Sciences. A simple random sampling was performed in this retrospective study. Specifically, 129 cases that were histopathologically diagnosed with radicular cysts, odontogenic keratocyst, dentigerous cysts, and ameloblastomas over the period of 2005 to 2016 with complete data were enrolled. The medical files of all patients were analyzed with regard to gender, blood type, and odontogenic lesion type. Data were analyzed using SPSS 18 (Statistical Package for the Social Sciences, version 23.0, SPSS Inc. Chicago, IL, USA) and χ^2 test. P value < 0.05 was considered as significant.

RESULTS

A total number of 129 patients with odontogenic lesions and known blood groups were recorded over the period of 2005 to 2016. Among 129 cases, 76 (58.9%) patients were male and 53 (41.1%) patients were female. The most common blood type was O, with 51 (39.5%) subjects, followed by A with 38 (29.4%) patients, B with 22 (17.1%) cases, and AB with 18 (14%) patients. The number of subjects per blood type is shown in Table 1.

Among these cases, 47 (36.4%), 39 (30.2%), 22 (17.1%), and 21 (16.3) had a dentigerous cyst, odontogenic keratocyst, radicular cyst, or ameloblastoma, respectively. The number of cases of odontogenic lesions by type are summarized in Table 2.

The distribution of blood groups among these 129 patients by odontogenic lesion type is shown in Table 3.

TABLE 1. Number of subjects by blood type

Blood group	Subjects, *n* (%)
O	51 (39.5)
A	38 (29.4)
B	22 (17.1)
AB	18 (14.0)

TABLE 2. Number of subjects by odontogenic lesion type

Odontogenic lesion	Subjects, *n* (%)
Dentigerous cyst	47 (36.4)
Odontogenic keratocysts	39 (30.2)
Radicular cyst	22 (17.1)
Ameloblastoma	21 (16.3)

TABLE 3. Distribution of blood groups by odontogenic lesion type

Blood group	Dentigerous cyst, *n* (%)	Odontogenic keratocysts, *n* (%)	Radicular cyst, *n* (%)	Ameloblastoma, *n* (%)
O	17 (36.17)	16 (41.02)	12 (54.54)	6 (28.57)
A	9 (19.14)	13 (33.33)	7 (31.81)	9 (42.85)
B	9 (19.14)	7 (17.94)	1 (4.54)	5 (23.80)
AB	12 (25.53)	3 (7.70)	2 (9.09)	1 (4.76)
Total	47	39	22	21

TABLE 4. A comparison of the number and percentage of patients with odontogenic lesions in each blood type, and the expected number and percentage of patients based on the normal distribution of blood types in the study population

Blood type	Expected number of patients based on the normal percentage of blood types in Iran	Normal distribution percentage of blood types in Iran	Number and percentage of patients with odontogenic lesions, *n* (%)
A	51.6	40	38 (29.8)
B	12.9	10	22 (17.1)
AB	63.5	5	18 (14.0)
O	58.1	45	51 (39.5)
Total	129	100	129

Blood types B and AB were associated with high incidence of odontogenic lesions, whereas blood groups O and A were associated with low incidence of odontogenic lesions ($p < 0.05$).

Blood types and radicular cyst, ameloblastoma, and odontogenic cyst incidences were not associated ($p > 0.05$). However, blood types B and AB were associated with high incidence of dentigerous cysts ($p < 0.05$).

The present study also showed that the odontogenic lesions evaluated were more prevalent in men ($n = 76$, 59%) than in women ($n = 53$, 41%). Also, the number of patients with dentigerous cysts was higher than the number of those with the other examined odontogenic lesions, followed by OKCs, radicular cysts, and ameloblastoma tumors, whereas in previous studies, the most common odontogenic lesions were radicular cysts, followed by dentigerous cysts, OKCs, and ameloblastoma tumors, which is a noticeable finding. According to the results, odontogenic lesions were more prevalent in blood type O, followed by blood types A and B. The lowest incidence of these lesions was in blood type AB. Based on these findings and their comparison with the frequency distribution of blood types in Iranians and the global population, the frequency distribution of odontogenic lesions in the studied patients by blood type was consistent with the frequency distribution of blood types in Iranians and the global population. The comparison of the data in Table 4 and the statistical analysis performed by the c^2 test showed a significant difference between the frequency distribution of blood types A and AB in the studied population with its normal distribution in the general population ($p < 0.001$). In other words, people with blood types B and AB were at a higher risk of developing odontogenic lesions than those with other blood types, which was similar to an earlier study by the same researchers that found a relationship between blood type and maxillofacial deformities. Also, the lowest risk of these lesions was observed in blood type A.

Comparing the total number of patients with each blood type (A, B, AB, and O) among the 129 patients with the four common odontogenic lesions under study and the expected number of patients in each blood type based on the normal distribution of blood types in Iran revealed a *p*-value less than 0.001. In other words, there was a significant relationship between blood type and the rate of development of odontogenic lesions. Based on the statistical analyses performed, patients with odontogenic lesions and blood types B and AB have risk factors for odontogenic lesions.

In the patients with OKC, the number of cases with blood types A and O was lower than the expected number based on the normal percentage of people with these blood types in the general population, and the number of patients with blood types B and AB was higher than expected (Table 5).

In the patients with radicular cysts, the number of patients with blood types A and B was lower than expected, and the number of patients with blood types AB and O was higher than expected (Table 6).

In patients with ameloblastoma tumors, the number of patients with blood types AB and O was lower than

TABLE 5. A comparison of the number of patients with odontogenic keratocyst by blood type in the studied population and the expected number of patients based on the normal distribution of blood types in the general population

Blood type	Expected number of patients based on the normal distribution of blood types in Iran	Number of patients with odontogenic keratocyst in different blood groups in the studied population
A	15.6	13
B	3.9	7
AB	2	3
0	17.6	16
Total	39	39

TABLE 6. A comparison of the number of patients with radicular cysts by blood type in the study population and the expected number of patients based on the normal distribution of blood types in the general population

Blood type	Expected number of patients based on the normal distribution of blood types in Iran	Number of patients with radicular cysts in different blood groups in the studied population
A	8.8	7
B	2.2	1
AB	1.1	2
0	9.9	12
Total	22	22

TABLE 7. A comparison of the number of patients with ameloblastoma tumors by blood type in the studied population and the expected number of patients based on the normal distribution of blood types in the general population

Blood type	Expected number of patients based on the normal distribution of blood types in Iran	Number of patients with ameloblastoma tumors in different blood groups in the studied population
A	8.4	9
B	2.1	5
AB	1.1	1
0	9.5	6
Total	21	21

TABLE 8. A comparison of the number of patients with dentigerous cysts by blood type in the study population and the expected number of patients based on normal distribution of blood types in the general population

Blood type	Expected number of patients based on normal distribution of blood types in Iran	Number of patients with dentigerous cysts in different blood groups in the study population
A	18.8	9
B	4.7	9
AB	2.4	12
0	21.4	17
Total	47	47

expected, and the number of patients with blood types A and B was higher than expected (Table 7).

In the patients with OKC, radicular cysts, and ameloblastoma tumors, *p*-value was more than 0.05, which revealed non-significance of relationship between these lesions and blood type, and could be due to small sample size. In the patients with dentigerous cysts, the number of patients with blood types A and O was lower than expected and the number of patients with blood types B and AB was higher than expected. In the dentigerous cyst cases, *p*-value was less than 0.05, which indicated that there was a significant relationship between blood type and development of dentigerous cysts. Based on the findings, people with blood types B and AB had a higher risk of developing dentigerous cysts, which was consistent with the present findings regarding the general comparison of relationship between the development of odontogenic lesions and blood type. The present findings were also consistent with the results of previous studies on the relationship between maxillofacial deformities and blood type (Table 8).

DISCUSSION

Antigens of the AB0 blood group are essential antigens in transfusion medicine [15-17], but their association with certain diseases remains unclear. The relationship between blood types and disease incidence was first hypothesized in the mid-1900s [18]. In 2008, Gheisari *et al.* [19] reported that ABO blood types and maxillofacial deformities are linked. Their results suggest an existing relationship between ABO blood types and certain diseases, which are consistent with our findings showing this relationship between blood types and odontogenic lesions. They also showed that among all blood types, blood type B has the highest association with maxillofacial deformities and blood type A has the lowest, which was found in our study regarding odontogenic lesions. Sidhu *et al.* in-

vestigated the association between ABO blood types and diabetes mellitus. They found that diabetes mellitus is associated with blood type AB [20]. Meo *et al*. reported that subjects with blood type B are at high risk of diabetes mellitus type 2, whereas individuals with blood type O are at low-risk of this disease [18]. The results of these above mentioned studies suggest that diabetes was more prevalent in blood types AB and B considering our results. Therefore, we can state more strongly that there is a relationship between these two blood types and certain conditions. Hsiao *et al*. suggested that ABO blood types are significantly associated with cancer risk. Men with AB blood type, women with A blood type, and subjects with A antigen were more likely to develop cancers than other subjects [14]. Bijanzadeh *et al*. stated that ABO blood types have a non-significant association with asthma among Indian population [21]. These results reveal that ABO blood types may have a relationship with certain conditions, which require more investigations to find out. Mortazavi *et al*. observed that individuals with blood type B are at a higher risk of developing oral cancer than individuals with other blood types [22]. Xie *et al*. demonstrated that the risk of developing skin squamous cell carcinoma is significantly lower in patients with blood type A than in patients with other blood types [23]. As our results demonstrated, blood type A had the least relationship to odontogenic lesions. Jin *et al*. showed that ABO blood types are associated with survival in patients with laryngeal cancer. Patients with blood type O have significantly shorter overall survival than patients with other blood types [24]. These results are consistent with our study, which found that blood types B and AB are associated with higher incidences of odontogenic lesions.

CONFLICT OF INTERESTS

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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