Original Article

HEALTH SCIENCES
MEDICINE

DOI: 10.32322/jhsm.1243805
J Health Sci Med 2023; 6(2): 462-466

Distribution of ABO blood groups and Rh factor in benign and malign thyroid nodules

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Cite this article as: Deniz MS. Distribution of ABO blood groups and Rh factor in benign and malign thyroid nodules. J Health Sci Med 2023; 6(2): 462-466.

ABSTRACT

Aim: Many factors affect the diagnostic value of the fine-needle aspiration biopsy applied for these thyroid nodules. I aimed to investigate whether one of these factors would be ABO blood groups and Rh factor and examine the relationship of these factors with the Bethesda categorization. Additionally, I aimed to evaluate ABO blood groups and Rh factors in patients with thyroid cancer.

Material and Method: This study was planned in a cross-sectional retrospective design. The data of the patients were obtained from the hospital data bank. In the analysis of 801 patients following the acceptance criteria, 412 patient data were obtained. Patients were divided into 4 (O, A, B, and AB groups) according to their blood groups and analyzed for nodules (solitary/ multinodular). Nodules were divided into malignant and benign, according to histopathological diagnosis, and all were analyzed.

Results: There was no difference in analyzing the demographic data according to the blood groups. The rates of the FNAB history were 51 (32.3%), 39 (24.2%), 14 (26.4%), and 13 (32.5%) in the same order of blood groups (p=0.393). In the analysis of the nodule type, multinodular did not differ from solitary nodules among the blood groups [O: 141 (89.2%); A:140(87%), B: 46(86.8%), and AB: 35(87.5%)]. Thyroid function status (euthyroid, hypothyroid, or hyperthyroid) was similar for all the blood groups (p=0.815). The O-group had 1 (0.6%) patient with Bethesda score-6, and the A-group had 2 (1.2%) patients with Bethesda score-6. For Bethesda score-5, per blood group had 2 patients. The histopathological distribution of malign nodules (p=0.782) is as follows: O-groups: 6 (33.3%) (Rh+:27%; Rh-:5,5%), A groups: 7(63,6%) (Rh+:54,5%; Rh-:0,9%), B groups: 2(20%)(Rh+:20%; Rh-:0%) and AB groups: 1(33%) (Rh+:33%) Rh-:0%).

Conclusion: Malign nodule rate was highest in the A-group and lowest in the B groups, although it did not differ in the overall analysis. No relationship was found between the Bethesda categorization of nodules, their sizes, type of nodules, type of thyroid cancer, and ABO blood groups.

Keywords: Thyroid biopsy, Bethesda score, ABO blood group, Rh factor, malign nodule, benign nodule

INTRODUCTION

Thyroid nodules are growths that develop within the thyroid gland, and while they are often benign, they can also be cancerous (1). It is important to note that the presence of nodules does not necessarily imply that the person has any disorder or that the nodules are malignant; many thyroid nodules are benign and do not require any treatment (2). They can be associated with changes in specific blood parameters, including thyroid hormone and thyroid-stimulating hormone levels. It is essential to consult a doctor or endocrinologist for accurate diagnosis and management. The appearance of these nodules is closely related to the personal susceptibility of the patients and varies (3). One of these individual characteristics is blood group type.

The presence or absence of specific antigens on the surface of red blood cells determines blood type (4). Some research suggests that certain blood types may be associated with an increased risk for certain diseases. However, it is essential to note that blood type alone is not a significant risk factor for most conditions, and other factors such as lifestyle, diet, and genetics play a much more substantial role (5). Blood type A may have a slightly increased risk of developing certain digestive tract cancers, such as stomach cancer (6). AB may have an increased risk of developing pancreatic cancer (7). Blood type O may have a slightly reduced risk of developing blood clots and venous thromboembolism compared to other blood types. Blood type B may

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Received: 28.01.2023 **Accepted:** 20.02.2023

have a slightly increased risk of developing lupus, an autoimmune disease (8). It is important to note that these associations are inconclusive, and more research is needed to understand the relationship between blood type and disease risk fully. Blood type and thyroid nodule are not known to have a direct connection. However, some studies have shown an association between blood type and certain thyroid disorders (9, 10). Individuals with blood type A had a higher risk of developing autoimmune thyroid disease than those with other blood types (11), and blood type O had a higher risk of developing benign thyroid nodules than those with blood type A (12). Although the correlation between autoimmune thyroid diseases and blood type has been shown (13), there is no study on nodules, as we reviewed the existing literature. The present study investigated the distribution of ABO blood groups and thyroid nodules.

MATERIAL AND METHOD

The study was carried out with the permission of Karabük University Non-interventional Clinical Researches Ethics Committee (Date: 20.12.2022, Decision No: 2022/1195). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. This study was planned in a cross-sectional retrospective design.

The data of the patients were obtained from the hospital data bank. In the analysis of 801 patients following the acceptance and rejection criteria, 412 patient data were obtained, whether they were eligible to participate in the study. Demographic and clinical data of the patients, as well as blood groups and thyroid nodule data, were analyzed together.

Patients' Groups

Two separate groupings were made for the patients. In the first grouping, patients were divided into 4 (O, A, B, and AB groups) according to their blood groups and analyzed for nodules (solitary/multinodular) and clinical effects. In the second classification, nodules were divided into two malignant and benign, according to histopathological diagnosis, and all were analyzed. They were evaluated as hypothyroid, euthyroid, and hyperthyroid according to thyroid functions. Blood groups were compared with this 6-point system in the Bethesda classification used diagnostically. Inclusion criteria for the study were that the patient was an adult (>18 years), all hospital data were complete with details, and blood group analysis was available. Our exclusion criteria included: those with unclear etiology, short follow-up, missing thyroid biopsy/Bethesda results, or those younger than 18.

Statistical Analysis

Statistical analysis was performed by the MS Windows 64x-based SPSS-v23 package program (IBM Inc., USA). After evaluating the conformity of the data with normal distribution with the Kolmogorov-Smirnov test, the normal distribution of numerical variables was shown as mean ± standard deviation and categorical variables as numbers and percentages. While Student's t-test was preferred to determine numerical variables that differed between two groups, the ANOVA test was used between 3 or more groups. We selected chi-square and Fisher exact chi-square tests to compare the categorical data. The $p<0.05$ was considered significant in the analysis.

RESULTS

In analyzing the demographic data according to the blood groups, there was no significant difference in the mean age (p=0.397) and BMI (p=0.153). The cross-table analyses of blood groups showed similarities in gender between the groups (p=0.282). These results showed that the participants' demographic data in terms of blood groups were compatible, and there was no difference, as seen in **Table 1**.

The rates of thyroid operation were 15 (9.5%), 10 (6.2%), 1 (1.9%), and 2 (5%) in order of O, A, B, and AB groups (p=0.194). The rates of the FNAB history were 51 (32.3%), 39 (24.2%), 14 (26.4%), and 13 (32.5%) in the same order of blood groups (p=0.393). In the analysis of the nodule type, multinodular did not differ from solitary nodules among the blood groups [O: 141 (89.2%); A:140 (87%), B: 46 (86.8%), and AB: 35 (87.5%)]. Thyroid function status (euthyroid, hypothyroid, or hyperthyroid) was similar for all the blood groups (p=0.815).

In malignancy analysis, the O group had 1 (0.6%) patient with Bethesda score-6, and the A group had 2 (1.2%) patients with Bethesda score-6. For Bethesda score-5, per blood group had two patients. However, the overall analysis did not differ for 4 group comparisons for Bethesda scoring (p=0.377). The histopathological distribution of malign nodules (p=0.782) is as follows: O-groups: 6 (33.3%) (Rh+:27%; Rh-:5.5%), A groups: 7 (63.6%) (Rh+:54.5%; Rh-:0.9%), B groups: 2 (20%) (Rh+:20% ; Rh-:0%) and AB groups: 1 (33%) (Rh+:33%) Rh-:0%).

DISCUSSION

In the present study, we analyzed the characteristics of thyroid nodules and the distribution of blood groups using clinical data. Malign nodule rate was highest in the A-group and lowest in the B groups, although it did not differ in the overall analysis. No relationship was found between the Bethesda categorization of nodules, their sizes, type of nodules, type of thyroid cancer, and ABO blood groups.

Table 1. Demographics and thyroid outputs of blood groups

Variables	0 Group		A Group		B Group		AB Group		P value
	Rh (+)	Rh (-)	Rh (+)	Rh (-)	Rh (+)	Rh (-)	Rh (+)	Rh (-)	
Gender									0,282
Male	33 (20.8%)	8 (5%)	30 (18.6%)	4 (2.4%)	11 (20.7%)	1 (1.8%)	3 (7.5%)	2 (5%)	
Female	86 (54.4%)	31 (19.6%)	119 (73.9%)	8 (4.9%)	32 (60%)	9 (16.9%)	30 (75%)	5 (12.5%)	
Age,year	53.2±11.7		52.6±13.2		51.6±12.2		55.9±14.2		0.397
BMI, kg/m²	29.1±5.7		29.1±5.5		28.1±5.8		30.8±6.2		0.153
Diameter, mm	18.3±9.9		19±9.6		20.3±13		17.7±10.5		0.562
Thyroid operation									0.194
No	109 (68%)	34 (21%)	139 (86%)	12 (7.4%)	42 (79%)	10 (18.8%)	31 (77.5%)	7 (17.5%)	
Yes	10 (6%)	5 (2.9%)	10 (6%)	0	1 (1.8%)	0	2 (5%)	0	
History of FNAB									0.393
No	79 (50%)	28 (17.7%)	113 (70%)	9 (5.5%)	32 (60.3%)	7 (13.2%)	23 (57.5)	4 (10%)	
Yes	40 (25%)	11 (6.9%)	36 (22%)	3 (1.8%)	11 (20.7%)	3 (5.6%)	10 (25%)	3 (7.5%)	
Nodule type									0.629
Solitary	12 (7.5%)	5 (3.1%)	21 (13%)	0	6 (11.3%)	1 (1.8%)	4 (16%)	1 (2.5%)	
Multinodular	107 (67.7%)	34 (21.5%)	128 (79%)	12 (7.4%)	37 (69.8%)	9 (16.9%)	29 (72.5%)	6 (15%)	
Thyroid function status									0.815
Euthyroid	72 (45.5%)	27 (17%)	87 (54%)	8 (4.9%)	26 (49%)	7 (13.2%)	20 (50%)	5 (12.5%)	
Hypothyroid	29 (18.3%)	5 (3%)	40 (24.8%)	2 (1.2%)	11 (20.7%)	3 (5.6%)	5 (12.5%)	2 (5%)	
Hyperthyroid	18 (11.3%)	7 (4.4%)	22 (13.6%)	2 (1.2%)	6 (11.3%)	0	8 (20%)	0	
Bethesda classification									0.377
1	22 (13.9%)	5 (3%)	19 (11.8%)	0	5 (9.4%)	2 (3.7%)	8 (20%)	3 (7.5%)	
2	57 (36%)	19 (12%)	74 (45%)	3 (1.2%)	20 (37.7%)	8 (15%)	17 (42.5%)	3 (7.5%)	
3	35 (22%)	15 (9.4%)	51 (31.6%)	9 (5.5%)	14 (26.4%)	1 (1.8%)	7 (17.5%)	1 (2.5%)	
4	2 (1.2%)	0	1 (0.6%)	0	1 (1.8%)	0	0	0	
5	2 (1.2%)	0	2 (1%)	0	2 (3.7%)	0	1 (2.5%)	0	
6	1 (0.6%)	0	2 (1%)	0	0	0	0	0	
Nodular nature									0.782
Non-malign	152 (96.2%)		154 (95.7%)		51 (96.2%)		39 (97.5%)		
Malign	6 (3.8%)		7 (4.3%)		2 (3.8%)		1 (2.5%)		

Table 2. Histopathology results and blood groups

Histopathology	0 Group		A Group		B Group		AB Group	
	Rh (+)	Rh (-)	Rh (+)	Rh (-)	Rh (+)	Rh (-)	Rh (+)	Rh (-)
Benign nodule	9 (50%)	3 (16.6%)	4 (36.3%)	0	5 (50%)	1 (10%)	1 (33%)	0
Malign nodule	5 (27%)	1 (5.5%)	6 (54.5%)	1 (0.9%)	2 (20%)	0	1 (33%)	0
Unknown	0	0	0	0	2 (20%)	0	1 (33%)	0

As a result of studies on the relationship between malignant diseases and blood groups have determined that some blood groups carry a higher risk of developing certain types of cancer (6). For example, people with A Rh-negative blood type have been found to have a higher risk of developing cancer in some types, such as colon cancer, which has a higher incidence (14). Likewise, people with B Rh-negative blood group have a higher risk of developing some types of cancer, such as kidney cancer (15), where it has a higher incidence. However, there is not enough evidence that these results have a definite cause-effect relationship (12). In particular, more detailed information about the relationship between malignant diseases and blood types can be obtained if more studies are carried out. This can help develop more effective strategies for the early detection and treatment of diseases.

Blood type and thyroid nodule are not known to have a direct relationship (16). Thyroid nodules are growths that develop within the thyroid gland, and while they are often benign, they can also be cancerous (2). On the other hand, blood type is determined by the presence or absence of specific antigens on the surface of red blood cells. However, some studies have shown an association between blood type and certain thyroid disorders (9, 12). There are few studies on differentiated malignancies of thyroid tissue (10). In the study of Vasan et al. (17), similar to ours, they could not detect any relationship between thyroid cancers and blood groups. Contrary to these results, another study determined that the risk of thyroid cancer showed lower incidence in patients with A compared to the O-group and reported that the non-B blood group compared to B-group showed similar results in their study (18).

Although the incidence of thyroid nodules in the population varies with each study, it is widespread, and 10% are malignant. In the study of Dagdeviren et al. (9), all nodules were benign, according to their biopsy results. According to them, there was no difference between the cases with and without benign thyroid nodules in ABO and Rh blood groups. In patients with benign thyroid disease, the blood distribution was O>A>B>AB, unlike A>O>B>AB, which is the distribution in the general Turkish population (19). Dagdeviren et al (9). attributed this difference to the fact that most of the study participants included in the study were patients with Hashimoto's thyroiditis and the high rate of O group. In our study, the participants' demographic data regarding blood groups were compatible, and the blood distribution was A>O>B>AB, similar to other studies in Turkey. The rates of thyroid operation were 15 (9.5%), 10 (6.2%), 1 (1.9%), and 2 (5%) in order of O, A, B, and AB groups. The rates of the FNAB history were 51 (32.3%), 39 (24.2%), 14 (26.4%), and 13 (32.5%) in the same order of blood groups. In the analysis of the nodule type, multinodular did not differ from solitary nodules among the blood groups. The histopathological distribution of malign nodules was as follows: O-groups: 6 (33.3%) (Rh+:27%; Rh-:5,5%), A groups: 7 (63,6%) (Rh+: 54,5%; Rh-:0,9%), B groups: 2 (20%) (Rh+:20%; Rh-:0%) and AB groups: 1 (33%) (Rh+:33%) Rh-:0%).

The most substantial aspect of the present study is that it is the first analysis to include the Bethesda classification and the clinical evaluation of the relationship between blood groups and thyroid malignancy. The most important limitation of the study was that we performed the study retrospectively and could not reach long-term follow-up data. Although there is a possibility that the data may not reflect the general population and may cause bias, with the absence of a control group and the inclusion of patients followed in a single center, it is almost impossible to provide this entirely in analyzes where distribution such as blood group is essential.

CONCLUSION

In conclusion, the malign nodule rate was highest in the A-group and lowest in the B groups, although it did not differ in the overall analysis. No relationship was found between the Bethesda categorization of nodules, their sizes, type of nodules, type of thyroid cancer, and ABO blood groups. While there may be a possible association between blood type and thyroid nodules, more research is needed to confirm and understand the underlying mechanisms.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Karabük University Non-interventional Clinical Researches Ethics Committee (Date: 20.12.2022, Decision No: 2022/1195).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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