Original Article

Relationship between the ABO Blood Group and Lung Cancer Susceptibility

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Abstract

Background: Lung cancer (LC) is one of the well-known fatal malignant neoplasms worldwide. **Objective:** The objective of this study was to determine the potential relationship between ABO and Rhesus blood groups with LC. **Materials and Methods:** A retrospective case series study was done on 500 patients diagnosed with LC using hospital case reports of both Nanakali Hospital and Rizgary Teaching Hospital and 182,408 healthy blood donors in Erbil city of Iraqi Kurdistan Region. **Results:** Blood groups of 500 LC patients were as follows: blood group A, 156 (31.2%); blood group B, 111 (22.2%); blood group O, 196 (39.2%); and blood group AB, 37 (7.4%), whereas blood groups of healthy donors were as follows: blood group A, 56,546 (31%); blood group B, 43,413 (23.8%); blood group O, 68,221 (37.4%); and blood group AB, 14,228 (7.8%). The difference was statistically not significant by Pearson's Chi-square (P = 0.909). Rh of patients was as follows: Rh negative in 42 patients (8.4%) and Rh positive in 458 patients (91.6%), whereas Rh of healthy donors was as follows: Rh negative in 18,241 patients (10%) and Rh positive in 164,167 patients (90%). The difference was statistically not significant by Pearson's Chi-square (P = 0.381). **Conclusion:** According to the results of the study, we found that there was no statistically significant relationship between ABO-Rhesus blood groups' LC susceptibility in general and also between different histopathological types.

Keywords: ABO, blood group, lung cancer, Rhesus

Introduction

Lung cancer (LC) is the leading cause of cancer deaths worldwide.[1] Despite smoking, which is a significant risk factor for LC, there are many other environmental and genetic risk factors for LC.[2,3] ABO blood group was discovered in 1900 by Karl Landsteiner at the University of Vienna, and he received the Nobel Prize for this discovery in 1930.[4] ABO blood group antigens are a group of glycolipids and glycoproteins; these antigens are participating in cellular differentiation, proliferation, maturation, and malignant transformation.[5] ABO blood group gene is mapped at chromosome 9q34, in which the genetic alterations are common.[6] The correlation of ABO blood groups with the development of certain cancers such as gastrointestinal cancer, urinary tract cancer, liver cancer, and LC is observed.[7,8] Because the data on the role of ABO blood group factor in LC are limited, therefore, this study aimed to determine the potential relationship of ABO and Rhesus blood groups with LC.

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Materials and Methods

Study design and sampling

A retrospective case series study was done on 500 patients diagnosed with LC using Hospital case reports of both Nanakali Hospital and Rizgary Teaching Hospital and 182,408 healthy blood donors in Erbil city of the Iraqi Kurdistan Region. Medical records from both Nanakali Hospital and Rizgary Teaching Hospital were reviewed, and variables such as age, gender, blood group, and Rh and histopathological type of tumor were studied from January 1, 2016, to December 31, 2018. The data about healthy donors such as sex, blood group, and RH from Erbil blood bank were taken from January 1, 2016, to December 31, 2018.

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Statistical analysis

The statistical calculations were performed using the Statistical Package for the Social Sciences (SPSS) version 23 (SPSS 23, IBM Company, Chicago, IL, USA). In cross tables, the Chi-square test was used. Fisher's exact test was used when the Chi-square test was inappropriate. $P \leq 0.05$ was considered statistically significant.

Ethical consideration

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. The study was approved by the Ethics Committee at Hawler Medical University.

Results

In this retrospective study, medical records of 500 patients with LC and 182,408 healthy blood donors from January 1, 2016, to December 31, 2018, were reviewed.

The ABO blood group and Rh factor are shown in Figure 1 in which the blood group O RH(+) is the most frequent (36%) followed by blood group A RH(+) (29%) while least frequent was blood group AB RH(−) (1%).

Blood groups of patients were as follows: blood group A, 156 (31.2%); blood group B, 111 (22.2%); blood group O, 196 (39.2%); and blood group AB, 37 (7.4%), whereas blood groups of healthy donors were as follows: blood group A, 56,546 (31%); blood group B, 43,413 (23.8%); blood group O, 68,221 (37.4%); and blood group AB, 142,28 (7.8%). The difference was statistically not significant by Pearson's Chi-square ($P = 0.909$), as shown in Table 1.

Rh of patients was as follows: Rh negative in 42 patients (8.4%) and Rh positive in 458 patients (91.6%), whereas Rh of healthy donors was as follows: Rh negative in 18,241 patients (10%) and Rh positive in 164,167 patients (90%). The difference was statistically not significant by Pearson's Chi-square ($P = 0.381$), as shown in Table 2.

Table 3 compares the ABO blood groups and Rh factor between different LC histopathological types, and the difference was statistically not significant by Pearson's Chi-square ($P = 0.783$).

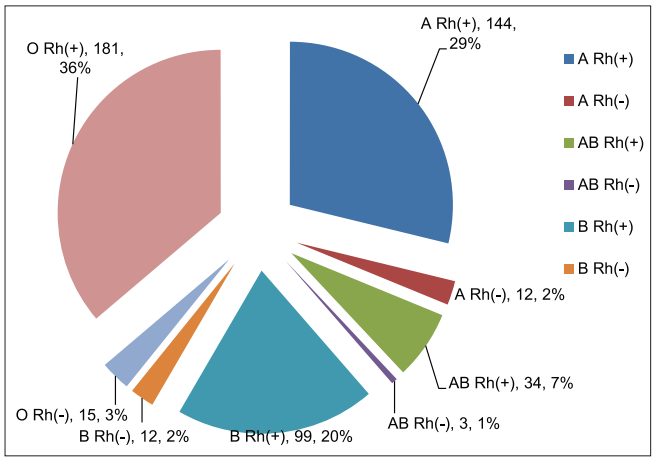

Figure 1: The ABO blood group and Rh factor in patients with lung cancer

Discussion

The ABO blood group is by far the most important among human blood group systems for tumorigenesis.[9] There are many studies on the association of ABO blood group and Rh with LC with different results. In our study, there was no significant correlation between ABO blood groups with LC in general and also between different histopathological types. There are some studies which support our findings which include the following:

Oguz *et al*. and Chrysanthakopoulos and Dareioti found no relationship between the ABO-Rhesus blood groups and LC.[10,11] Another study done by Unal D *et al*. found no significant effect of the ABO blood group on prognosis in nonmetastatic locally advanced non-small cell LC (NSCLC).[12]

On the other hand, some studies concluded that there is a positive correlation between blood group and the risk of LC like the following studies. Zhang *et al*. concluded that blood group A is associated with an increased risk of cancer,[13] while on the contrary, Suadicani *et al*. found that blood group O is a risk factor for LC mortality than blood group A.[14] Another study done by Sánchez-Mora *et al*. suggests that the loss of histo-blood antigen expression is an event in the carcinogenesis of the bronchial mucosa, and it is usually associated with high-grade lesions.[15]

Some previous studies conclude that Rh positivity alone without an ABO blood group is a risk factor for LC.[16] In contrast, other researches showed that the absence of Rh factor

Table 1: Distribution of ABO blood groups in lung cancer cases compared with controls

Blood group	Lung cancer, *n* (%)	Control©, *n* (%)	Total, *n* (%)
A	156 (31.2)	56,546 (31)	311 (31.1)
B	111 (22.2)	43,413 (23.8)	230 (23)
O	196 (39.2)	68,221 (37.4)	383 (38.3)
AB	37 (7.4)	14,228 (7.8)	76 (7.6)
Total	500 (100)	182,408 (100)	1000 (100)

Pearson χ^2 (P=0.909) Pearson's chi-squared test (χ^2) was performed for statistical analyses which was statisticaly non significant (P =0.909)

Table 2: Comparison of Rh factor between lung cancer patient and control groups

Rh	Lung cancer, *n* (%)	Normal healthy donor, *n* (%)	Total, *n* (%)
Rh−	42 (8.4)	18,241 (10)	92 (9.2)
Rh+	458 (91.6)	164,167 (90)	908 (90.8)
Total	500 (100)	182,408 (100)	1000 (100)

Pearson's chi-squared test ($\chi 2$) was performed for statistical analyses which was statisticaly non significant.($p = 0.381$). RH + : Rhesus factor positive, RH - : Rhesus factor negative

Table 3: Comparison of ABO blood groups and Rh factor between different lung cancer types

Lung cancer types	A		AB		B		O	
	Rh (+)	Rh (−)	Rh (+)	Rh (−)	Rh (+)	Rh (−)	Rh (+)	Rh (−)
Adenocarcinoma, *n* (%)	63 (32.8)	4 (2.1)	14 (7.3)	2 (1.0)	33 (17.2	2 (1)	71(37)	3 (1.6)
Squamous cell carcinoma, *n* (%)	48 (25)	4 (2.1)	12 (6.3)	0	38 (19.8)	8 (4.2)	75 (39.1)	7 (3.6)
Large cell carcinoma, *n* (%)	9 (29)	0	2 (6.3)	0	10(32.3)	0	9 (29)	1 (3.2)
Small cell carcinoma, *n* (%)	24 (28.2)	4 (4.7)	6 (7.1)	1 (1.2)	18 (21.2)	2 (2.4)	25 (29.4)	5 (5.9)
Healthy donors, *n* (%)	50,709 (27.8)	5837 (3.2)	12,404 (6.8)	1824 (1)	38,671 (21.2)	4743 (2.6)	60,559 (33.2)	7661 (4.2)

Pearson's chi-squared test (χ^2) was performed for statistical analyses which was statisticaly non significant.($P = 0.83$)

has a two-fold increased risk for NSCLC,[17] but in our study, Rh has no relationship with LC.

Conclusion

According to the results of our study, we found that there was no statistically significant correlation between ABO-Rhesus blood groups with LC in general and also between different histopathological types.

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Conflicts of interest

There are no conflicts of interest.

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