

Original Research Article

Correlation between ABO blood groups and various cancers in the north eastern region of India: a retrospective observational study

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ABSTRACT

Background: Numerous studies have documented the association of the ABO blood groups with the occurrence of cancers. Aim was to find out an association of ABO blood groups and various cancers in the North Eastern region of India.

Methods: The study was a retrospective observational study that included 1000 cases and 1000 controls. The data included the ABO blood typing of the selected cancer sites which were head and neck, esophagus, stomach, breast, cervix, and ovary. Patients who attended blood bank of regional cancer center with requisition for blood transfusion from 2014 to 2016 were included. The control group was healthy blood donors. Chi square test was used to assess the difference among the compared groups. Risk was calculated by regression analysis. P value <0.05 was considered as statistically significant at 95% confidence interval.

Results: Out of 1000 cases and 1000 controls, O blood group were seen in 377 (37.7%) and 395 (39.5%) cases and control, respectively. Significant reduced odds ratio (OR) in non O blood groups for head and neck, esophagus, stomach, and breast was observed. In case of carcinoma cervix, OR for B group was 1.5 (P=0.05), and for blood group A OR=2.2 (P=0.02) was seen in carcinoma ovary.

Conclusions: In the studied population, patients with O blood group are at an increased risk of developing head and neck, esophagus, stomach, and breast cancers.

Keywords: Blood group, Cancer, Correlation, North east India, Risk

INTRODUCTION

The ABO blood group system was discovered by Karl Landsteiner in 1900, who classified the human blood into A, B, O groups followed by the discovery of fourth blood group AB by Landsteiner's associates Von Decastello and Sturli in 1902. The four groups are determined by the presence or absence of blood group antigens (agglutinogens) on the red blood cell surface and accordingly an individual blood group is A, B, O, and

AB. Corresponding to the antigens there are naturally occurring antibodies (agglutinins) anti-A and anti-B in the plasma/serum of individuals whose red cells lack the corresponding antigens. The blood group antigens are present not only on the red blood cell surfaces but also widely distributed throughout the body tissues and secretions.¹⁻³

The basic precursor substance of A and B antigens is an oligosaccharide which is converted by an enzyme L-

fucosyl transferase (a product of H gene) to H substance by addition of sugar L-fucose to terminal D-galactose of the precursor substance.^{4,5}

Cancer is one of the leading causes of morbidity and mortality worldwide. There are many etiological factors of cancers amongst which genetic factor is one. The blood group of an individual can be detected by various methods and is an easily accessible factor in an individual genetic makeup. Numerous reports and studies have documented the association of the blood groups with the occurrence and development of various infectious and non infectious diseases.^{2,3,6-8} The distribution of ABO blood group amongst the population varies according to the geographical location, ethnicity, and race.

The present study was to explore the possible relationship between blood groups and to see its association with various cancers in patient population of the North Eastern Region of India.

METHODS

The study was a retrospective observational study that included 1000 cases and 1000 healthy controls of all age groups and both genders.

The data included ABO blood typing of the selected cancer sites. The selected cancer sites were head and neck, oesophagus, stomach, breast, cervix, and ovary. Patients who attended the blood bank of regional cancer center with requisition for blood transfusion from 2014 to 2016 were included as cases. The control group was healthy age and gender matched blood donors. The method used for determining blood group of the cases and control was the conventional tube method (forward and reverse grouping).

Chi square test was used to assess the difference among the compared groups. Risk or the odds ratio was calculated by regression analysis. P value <0.05 was considered as statistically significant at 95% confidence interval. To calculate the odds ratio with cancer sites and blood groups, blood group O was considered as the reference blood group.

RESULTS

Overall distribution of ABO blood groups showed that O group (37.7%) was most common, followed by B (31.4%), A (22.0%), and least commonly seen in AB (8.9%) group amongst cases. In controls, O group was 39.5% followed by B (31.9%), A (22%) and least common is the AB blood group (6.6%) (Table 1).

The risk of cancer cervix in blood group B individuals was significantly higher than that in O group (P=0.05, odds ratio (OR) =1.8, 95% confidence Interval (CI) =1.0-3.2), as shown on Tables 2 and 3.

Table 1: Prevalence of blood groups among cases and control in the study.

Blood group	Cases		Control	
	Frequency	Percentage (%)	Frequency	(%)
O	377	37.7%	395	39.5%
B	314	31.4%	319	31.9%
A	220	22.0%	220	22.0%
AB	89	8.9%	66	6.6%
Total	1000	100%	1000	100%

Table 2: Distribution of the blood groups among six major sites in the study.

Cancer sites	Blood group (%)			
	O	B	A	AB
Esophagus	45.7	28.3	13	13
Stomach	42.7	29.3	22	6.1
Breast	40	22.9	28.6	8.6
Cervix	29.6	42.3	21.1	7
Ovary	26.9	29.9	32.8	10.4
Head and neck	38.7	32.5	20.8	8.2

A significant association was observed among the cases with A blood group in relation to developing ovarian cancer. Ovarian cancer patients with A blood group were having a 2.2 times risk (P=0.02, OR=2.2, CI=1.2-4.2) compared to other blood groups.

The individuals with non O blood group showed a significant reduced risk of stomach cancer, compared to O individuals, for persons with A (OR=0.92, 95% CI 0.51-1.67), B (OR=0.85, 95% CI 0.50-1.46) and AB (OR=0.84, 95% CI 0.32-2.23) (Table 2 and 3). No significant association was observed among breast and oesophageal cancer with respect to other non O group when compared to O group. There is a reduced risk found with B blood group (P=0.28, OR=0.71, CI=0.38-1.33) for breast cancer (Table 2 and 3). For esophageal cancer a reduced risk was found for persons with A blood group (P=0.16, OR=0.51, CI=0.20-1.29) as compared to O group (Table 2 and 3).

No statistically significant association was observed among head and neck cancers with respect to non O blood groups when compared to O group as reference.

DISCUSSION

Till date many case-control, cohort, prospective studies have been done to find out an association between ABO blood group and the various cancer sites. Few have conducted a meta-analysis of observational studies to assess this association; whereas others have confined the study to certain sites like breast, stomach, ovary, and cervix. These studies were done on the basis of the fact and evidences that, ABO blood group system is now not

only confined to the immunohaematology but also involved in the development of diseases which may be infectious or non infectious including the cancers.² The mechanism of the association of the ABO blood groups and cancer development although is elusive but can be

explained on the basis of certain biological evidences like Mendelian law of Inheritance and wide distribution of ABO antigens throughout the various body tissues and secretions other than red blood cells.^{1,3}

Table 3: Distribution of ABO blood group between cases and controls.

Site	Blood group	Case	Control	OR	(95% CI)	P value
Stomach	O	35	395	Ref		
	A	18	220	0.92	0.51 to 1.66	0.79
	B	24	319	0.85	0.49 to 1.45	0.55
	AB	5	67	0.84	0.31 to 2.22	0.73
Cervix	O	21	395	Ref		
	A	15	220	1.28	0.64 to 2.53	0.48
	B	30	319	1.77	0.99 to 3.14	0.05
	AB	5	67	1.40	0.51 to 3.85	0.51
Breast	O	28	395	Ref		
	A	20	220	1.28	0.70 to 2.32	0.41
	B	16	319	0.71	0.37 to 1.33	0.28
	AB	6	67	1.26	0.50 to 3.16	0.62
Ovary	O	18	395	Ref		
	A	22	220	2.19	1.15 to 4.18	0.02
	B	20	319	1.38	0.71 to 2.64	0.34
	AB	7	67	2.29	0.92 to 5.69	0.07
Esophagus	O	21	395	Ref		
	A	6	220	0.51	0.20 to 1.29	0.16
	B	13	319	0.77	0.37 to 1.55	0.46
	AB	6	67	1.68	0.65 to 4.32	0.28
HNC	O	151	395	Ref		
	A	80	220	0.95	0.69 to 1.30	0.76
	B	127	319	1.04	0.78 to 1.37	0.77
	AB	32	67	1.25	0.78 to 1.98	0.34

*OR=Odds Ration, REF=Reference, HNC=Head and Neck Cancer

The blood group antigens expressed on the malignant cell surfaces was found to be different from that of normal cells. This alters the cell motility, sensitivity to apoptosis which influence the initiation and spread of cancer. In many recent studies, association have also been found between ABO blood groups and circulating levels of tumor necrosis factor-alpha, soluble ICAM-I, E-selectin, P-selectin, which suggests that the blood group antigens influence systemic inflammatory response.⁵

This study was a case-control study in which we included six selected cancers sites from 1000 histopathologically proven cancer cases. The six sites were that of esophagus, stomach, breast, cervix, ovary, and head and neck. The overall distribution of ABO blood groups amongst both the cases and the controls in our study was found to be O>B>A>AB, which vary from that northern Indian cancer patients, where B>O>A>AB is seen.^{9,10}

In this present study, O group was found to be more common among the esophageal cancer cases (45.7%), stomach (42.7%), breast (40.0%), and head and neck

(38.7%). B group was more common in cases of carcinoma cervix (42.3%) and A blood group in cases of carcinoma ovary (32.8%).

Finding from previous studies vary from the present study, however few of the findings were consistent. As reported in one study, there was no relation of blood group and breast cancer, whereas in another study it was found to be associated with blood group A as compared to AB.^{11,12} This study showed a higher association of O blood group with carcinoma breast as compared to non O blood groups.

Several authors have reported a higher incidence of gastrointestinal cancers in blood group A and few had found it to be associated with group B. Blood group O was found to be associated with a decreased risk of overall cancers and cancer of stomach, pancreas, breast, colorectal, ovarian, esophagus, and nasopharynx.¹³ In this case the findings in this study vary as it was found that a higher incidence of O blood group was associated with carcinoma stomach (42.7%), breast (40.0%), esophagus

(45.7%) head and neck (38.7%). This finding can be related to another study where the O group was found to be more among cancers of esophagus and head and neck.¹⁴

A higher risk of carcinoma cervix was found in group B (42.3%) in the present study, which is similar to many other studies findings who also reported a higher incidence of carcinoma cervix ,genitourinary cancers with blood group B.^{15,16} Also, a significant association was observed between carcinoma ovary and individuals with blood group A (32.8%), which is again similar to findings of other research groups who showed that in comparison to O group , blood group A was significantly more common with ovarian cancer.¹⁵⁻¹⁷

There were certain limitations of this study. The studied population was limited to only those who had attended the blood bank for blood requisition. The association of certain cancers with the blood groups could not be determined as their percentage was less as compared to the other sites that have been considered.

In this study, no molecular or genetic analysis was done to show the association of ABO blood group with various cancers. It was a retrospective observational study between healthy donors and cancer patients.

CONCLUSION

In conclusion, this study has provided a clue for the association between the blood groups and various cancers in the population of North Eastern India. In the studied population, patients with O blood group are at an increased risk of developing stomach, esophagus, breast, and head and neck cancers and individuals with blood groups B and A are at increased risk of developing cervical cancer and ovarian cancer, respectively.

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