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Original Article

Association of ABO blood group in breast cancer

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ABSTRACT

Background: The present study aims to find an association between ABO blood groups and breast cancer in the northern part of India. Method: A total of 500 cases (116 cases benign breast disease, 164 breast cancers and 220 as healthy control) were included in the present study. Relative risk has been calculated by logistic regression in different ABO blood groups. Results: The study reveals that risk of developing cancer is higher in the blood group A (RR=3.447; CI: 2.062-5.762) and AB (RR=3.659; CI: 1.893 - 7.070) than in blood group B and the difference is statistically highly significant. There is no difference in the risk of cancer between the persons having blood group B and O. Conclusion: Thus the most vulnerable blood group regarding breast cancer was found to be A and AB in comparison to blood groups B and O. This study also suggests that among the breast cancer is more likely to grow among those who have blood groups A (RR=2.157; CI: 1.222-3.808) and AB (RR=3.052; CI: 1.303-7.149) than the patients who have blood groups B and O.

1. Introduction

Breast cancer is the most common cancer among urban Indian females and second commonest in rural India, and the incidence is continuously increasing [1]. It is worthwhile to mention that breast carcinoma is one of the common malignancies among women in India. Since the first report by Aird et al. [2], showing an association between blood group A and gastric cancer, numerous other reports have documented a high incidence of blood group A in various cancers including salivary gland, colon, uterus, ovary, pancreas, kidney, urinary bladder, cervix and gall bladder [3, 4]. However, evidences suggest ABO blood groups to have importance in tumor genesis, since the blood group antigens seem to have a significant biological role in the immunological system via which they may promote development of some tumors, including carcinoma of the breast [5]. In this paper the distribution of ABO blood groups among patients have been studied with breast carcinoma, comparing it with blood group distribution in patients with benign breast diseases and healthy controls.

Material & methods:

This study includes three groups i.e. breast cancer disease, benign breast disease and healthy controls. Patients with breast diseases from single Surgical Unit of University Hospital, Institute of Medical Sciences, Banaras Hindu University from the period between 2009 to 2012, after informed consent were recruited. Blood donors were recruited as healthy control. Out of 500 cases, 164 women were having breast cancer, 116 with benign breast diseases and 220 are from healthy control. Blood sample (2 ml) was collected from each case and control, group was identified. Study was approved by the Ethical Committee of the Institute of Medical Sciences. Statistical analysis was performed by using SPSS 11.0 (SPSS, Chicago, IL, USA). Logistic regression analysis has been used to estimate the relative risk. In order to calculate relative risk, benign breast disease and healthy control group were taken as control and breast cancer as a case and in another analysis benign breast cancer is taken as control and breast cancer as a case.

Results:

The age distribution has been given in the table 1 and ABO blood group distribution in table 2. Incidence of breast cancer patients was higher in age group >35 while benign and control group < 35 (Table 1). Frequency of breast cancer in blood groups A (49.5 %) and AB (51.0 %) is higher in comparison to benign breast diseases and the difference is statistically significant ($p<0.05$) (Table 2). The relative risk of breast carcinoma in blood group A and AB was 3.447 and 3.659 times higher than the risk in other blood groups and the difference is statistically significant ($p<0.05$) (Table 3). Logistic analysis in which the benign breast disease is taken as control and breast cancer as a case suggests that the patients whose blood group either A or AB have significantly higher chance of having breast cancer than the patients whose blood is B or O (Table 4).

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Table 1: Frequency distribution of different groups (control and cases) according to age groups

Age group	Group			Total
	Benign Breast Disease	Breast Cancer	Control	
<20	27 (35.1 %)	0 (0%)	50 (64.9 %)	77 (15.4 %)
20-35	82 (31.1 %)	20 (7.5 %)	162 (61.4 %)	264 (52.8 %)
35-50	7 (6.6 %)	92 (89.8 %)	7 (6.6 %)	106 (21.2 %)
>50	0 (0 %)	52 (98.1 %)	1 (1.9 %)	53 (10.6 %)
Total	**116**	**164**	**220**	**500 (100 %)**

Table 2: Frequency distribution of different groups (control and cases) according to ABO blood groups

Blood Groups	Groups			Total
	Benign Breast Disease	Breast Cancer	Control	
A	24 (22.4%)	53 (49.5%)	30 (28.1%)	107 (21.4%)
AB	8 (16.3%)	25 (51.0%)	16 (32.7%)	49 (9.8%)
B	58 (31.4%)	41 (22.2%)	86 (46.4%)	185 (37%)
O	26 (16.4%)	45 (28.3%)	88 (55.3%)	159 (31.8%)
Total	116	164	220	500

χ^2=43.536 **(*p*= 0.000)**

Table 3: Table representing the relative risk of blood group A, AB and O with respect to B blood group in breast cancer in comparison to control (benign breast diseases and healthy control)

Characteristics	Relative Risk	*p*-value	95% Confidence Interval of Odds Ratio
Blood Group			
A	3.447	0.000	2.062 - 5.762
AB	3.659	0.000	1.893 - 7.070
O	1.386	0.191	0.850 - 2.261

Reference Category: Blood Group B

Table 4: Table representing the relative risk of blood group A and AB with respect to blood group B and O in breast cancer in comparison to benign breast diseases

Characteristics	Relative Risk	*p*-value	95% Confidence Interval of Odds Ratio
Blood Group			
A	**2.517**	**0.008**	**1.222 - 3.808**
AB	**3.052**	**0.010**	**1.303 - 7.149**

Reference Category: Blood Group B & O

Discussion:

Many risk factors are associated with the development of breast cancer, it was seldom mentioned that blood group has an influence on susceptibility and outcomes. Several investigators had recognized ABO blood groups as a predisposing or prognostic factor in breast cancer [5-8] and in other cancers [9-11]. Our hypothesis was that the blood group A and AB are more prone to breast cancer than other blood groups (B and O) as they are more common in control population. This study, however, shows increased frequency of breast carcinoma in blood groups A and AB compared with the control populations, which is similar to the previously reported increased incidence of blood group A in patients with carcinoma of stomach, colon, uterus, cervix and gallbladder [2-4]. Studies have shown that women with blood group A are generally prone to develop neoplasm and women with blood group O have some "protection" against breast carcinoma [6]. Furthermore, women with blood group AB have been reported to have similarities to blood group A and in contrast, women with blood group B have similarities with women of blood group O [7]. The increased risk of development of gastric and colonic cancers in patients with blood group A has been explained by the expression of Forssmann antigen in these cancers. Forssmann antigen is structurally similar to the blood group antigen A. Because of this similarity, antibodies to A may also attack precancerous and cancerous cells expressing this antigen. People with blood groups A and AB lack antibodies to A and hence are more prone to develop these carcinomas [4]. This might also apply to the mechanism behind the higher prevalence of blood group A and AB in breast cancer patients. It has already been reported that blood group B and O are more common in general population [5]. In a study, it has been observed that the risk of having pancreatic cancer is higher in blood group A (RR=1.52, 95 C.I.: 0.87-2.61). It reports a positive association between blood type A and pancreatic cancer [12].

It is also possible that there may be genes associated with a factor or factors that confer a favorable prognosis, closely related to the genes responsible for the expression of the blood group antigens, which may inherit together [5]. Further studies on antigenic determinant in tumor tissues with clinicopathological correlation might further elucidate this relationship [13]. A meta-analysis study found that persons having blood group A had a slightly higher risk of developing breast cancer among Caucasians. But the study did not find any significant association between ABO blood type and breast cancer in other populations [14]. Blood group A is more common in gastric cancer than blood group O, which has already been established in an association between ABO blood group and different cancers [9, 15, 16-18]. Several studies have also described blood group A as genetic marker for ovarian cancer [19-21].

Conclusion:

In conclusion, blood groups A and AB have been found to be significantly associated with breast cancer. The relative risk of breast carcinoma in blood group A or AB was 3.447 or 3.659 times higher than the risk in other blood groups. Further studies on the blood group antigenic determinant in tumor tissues with clinicopathological correlation might elucidate this relationship.

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Conflict of interest: Authors declared no conflict of interest.

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