IJBC 2010;1: 155-159

ABO blood groups and prognosis of breast cancer: a case-control study in Arak/Iran

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Submit: 09-02-2011, Accept: 20-05-2011

Abstract

Background: To explore a possible relationship among blood groups and the prognosis of breast cancer, this case-control study was carried out in Arak city, Arak province, Iran.

Materials and Methods: One hundred and thirty four patients with breast cancer were investigated. ABO blood groups were obtained from medical records. Multivariate analyses were performed, including size of tumor, axillary lymph nodes involvement and prognosis of the patients.

Results: We found that there is a significant relationship between the blood type and the size of tumor (P.V=0.035), axillary lymph nodes involvement (P.V=0.001) and the prognosis of the breast cancer (P.V=0.014).

Conclusion: The blood type of among our patients with breast cancer seems to be a prognostic factor and the presence of B-antigen shows association with poor prognosis of breast cancer.

Keywords: Breast cancer, blood group, prognosis

Introduction

Breast cancer is the most frequent malignant tumor, accounting for 30 percent of all malignancies and the second cause of mortality due to cancer among females. The mortality of this cancer mostly occurs in the peak of familial, social and economic activities in (35 – 45 years of age).

The incidence of breast cancer is 1 per 7 women and the probability of involvement is 12/5% in during the lifetime. Because of the improvements in early diagnosis of breast cancer, its mortality rate has remained steady, although the incidence of breast cancer has increased.

Many factors have important role in the incidence of breast cancer such as genetic factors, hormone consuming, lactation, late menopause, diet, radiation, alcohol consumption and exogenous estrogen intake. [1, 2, 3, 4]

On the other side, the tumor size, estrogen and progesterone receptor status and levels, tumor histology and the speed of cellular proliferation are some factors which affect the the prognosis.[4,5] If the disease has poor prognosis, various invasive therapeutic methods will be used to treat patients.

The blood group type is one of the genetic factors which affect the risk of different cancers. Studies of associations between tumors outcome and the patients' ABO blood groups have shown increased relative risks for some of blood groups. The A type is more frequent in patients with larynx and hypopharynx tumors, acute myeloblastic leukemia, ovarian, pancreas, breast, vulvar and gastric malignancies. A positive association with O type has been reported with several tumors like the squamous cell carcinoma of the esophagus, gastric cancer, acute lymphoblastic leukemia and skin melanoma. Few other differences have been described for other blood groups namely the endometrial cancer and advanced stages of esophageal cancer have been associated with a higher frequency of AB type, a more frequent B type and less frequent O type has been observed in pancreatic cancer, as well as a high frequency for B blood group in Hodgkin's lymphomas as well as cardiac cancer.[6, 7, 8, 9, 10, 11, 12, 13, 14]

The Rh factor and its association with cancer has been analyzed in a few studies. A higher frequency of Rh+ has been reported in colorectal cancer and it is also associated with more advanced stages of the disease. Endometrial cancer has been associated with a more frequent Rh− factor combined with AB group.[6, 12, 15, 16]

We carried out the present study to analyze blood factors and their possible association with breast cancer in view of its potential contribution to generate a new risk group, despite the limitations that such an analysis within a particular population involves.

Materials and Methods

This case–control study was carried out during a period between 1996 and 2005. The studied population consisted of cases with breast cancer who were hospitalized in Vali-Asr and Ghods hospitals in Arak city, Arak province, Iran. The case group comprised of patients who had breast cancer with poor prognosis and the control group involved patients who had breast cancer with a good prognosis. A checklist was filled for each patient consisting of age, sex, the tumor size, axillary lymph nodes involvement, prognosis and the type of ABO blood group. If there was a lack of blood group information, we abstained this information by referring to patient according to her address, and the blood group was determined using direct agglutination method.

Inclusion criteria were the presence of breast cancer based on the pathologic report available in the file. Exclusion criteria consisted of uncooperation of patients and the absence of patient for determining the blood group.

In the next stage, patients were divided into two groups: patients with good prognosis and patients with poor prognosis based on the tumor size (less than or equal 5 cm, more than 5 cm) and the presence or absence of axillary lymph nodes involvement. Good prognosis in patient means size of tumor is less than 5 cm without axillary lymph nodes involvement. Poor prognosis in patient means the tumor size was more than 5 cm with axillary lymph nodes involvement. Ten patients were omitted from the study according to exclusion criteria.

In the last stage, collected information was analyzed by descriptive statistical scales and chi square test. All the calculations were performed using the SPSS software.

Results

In this study, 134 hospitalized patients with breast cancer were investigated.

The mean age was 49.2 + 12.7 year. The duration of hospitalization was 6.4 + 3.4 day.

The tumor size was less than 5 cm in 34.1 percent of the patients and more than 5 cm in 65.9 percent of patients.

Of patients studied 38.5 percent did not show axillary lymph nodes involvement and 61.5 percent had axillary lymph nodes involvement.

In this study 31.3 percent of patients had good prognosis and 68.7 percent had poor prognosis.

The most prevalant blood group among patients with breast cancer was B-negative, and the least

Table 1. The relationship between the tumor size and the blood group among patients with breast cancer, Vali-Asr and Ghods hospitals, Arak, Iran, from 1996 to 2005.

Sum	Size of tumor (more than 5 cm)	Size of tumor (less than 5 cm)	Blood group
22	10	12	A
41	30	11	B
38	32	6	AB
33	15	18	O

P value = 0.035

The results indicated a significant relationship between the tumor size and the blood type (P = 0.035).

The results related to the relationship between the blood groups and the axillary lymph nodes involvement is shown in table 2.

prevalant blood group was A-negative.

The relationship between the blood group and tumor size is summarized in table1.

Discussion

The results of the present study indicate that the most frequent blood groups among patients with poor prognosis are AB-positive and B-negative blood groupsand the highest level of good prognosis is related to O negative blood group.

According to literature, the association of breast cancer and the blood type has had different degrees in various studies. For example it has been reported that A-blood group is more frequent in patients with breast cancer in comparison with O-blood group.[17]

Another study performed in 2005, has indicated that the risk of breast cancer in both familial and sporadic cases is related to the ABO blood group and the bilateral familial breast cancer have is more prevalent in B-blood group than sporadic cases. [17]

Our study show that the presence of B-Antigen is related to poor prognosis of the breast cancer, but the result achieved from a study performed on 551 patients with breast cancer in 1999 by Manzarovu et al., shows indicates no relation between the blood groups and breast cancer.[18]

The result of another study by Akammu et al. shows there is a negative relation between RhD antigen heritage and the diffusion of breast cancer and the RhD phenotype could be conservative against breast cancer.[19]

A study performed among 1001 patients with invasive breast cancer in 1995 by Holdsworth et al. shows the B or AB blood groups to be a prognostic factor, especially in patients who are at high risk for early mortality or tumor recurrence with AB blood group showing a relation with higher local occurrence.[20] Blood groups in our study show a prognostic value and the B-antigen is related with poor prognosis of the breast cancer, which is in line with Holdsworth et al. findings.

Also a study performed by Jalali-Naduoshan et al. in Zanjan, Iran, in 2002, showed that there is a relationship between the B-antigen of the blood group and the poor prognosis of the breast cancer.[21]

A study performed in three training hospitals in Tehran, Iran, shows that the blood groups among patients with breast cancer and normal population are not significantly different.

But the chance of poor prognosis among patients who have B-antigen was approximately 8.1 fold compared to other patients.

While the results show that the most prevalent blood groups in patients with poor prognosis are AB-positive and B-negative and the most prevalent blood group in patients with good prognosis of breast cancer is the O-negative.

ABO blood group genes, are mapped at chromosome 9q, in which the genetic alteration is common in many cancers.[22] Therefore, the ABO blood group antigen expression may be affected by the genetic changes of tumors. On the other hand, it is possible that our observed associations are not due to the blood group antigens themselves, but to the effects of genes closely associated with them. Furthermore, it might have nothing to do with molecular mechanisms or genetics.[6]

Table 2. The relationship between the axillary lymph nodes involvement and the blood group among patients with breast cancer, Vali-Asr and Ghods hospitals, Arak, Iran, from 1996 to 2005.

axillary lymph nodes involvement	Lack of axillary lymph nodes involvement	Blood group
8	14	A
27	14	B
33	5	AB
15	18	O

P value < 0.001

There was a significant relationship between the blood group and lymph nodes involvement ($P < 0.001$).

Table3 shows the relationship between the blood group and tumor prognosis.

Table 3. The relationship between the tumor prognosis and blood groups among patients with breast cancer, Vali-Asr and Ghods hospitals, Arak, Iran from 1996 to 2005.

Poor prognosis	Good prognosis	Blood group
11	11	A
31	9	B
33	5	AB
16	17	O

P value =0.014

There was a significant relationship between the blood type and tumor prognosis (P value = 0.014).

Our study had some limitations. The sample size was a major limitation. In addition, we were not able to perform population stratification; therefore the chance of a bias regarding ethnic differences between cases and controls cannot be precluded. On the other hand, both cases and controls belong to a relatively homogeneous base population.

Conclusion

Our study suggests an association between ABO blood group and the prognosis of breast cancer. More studies with a larger more diverse sample size among patients of different origins and including the blood factors in the first degree relatives afflicted with cancer patients, are needed to confirm the suggested trends.

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