REVISTA O MUNDO DA SAÚDE

Blood type evaluation in breast cancer patients at an oncology center in Agreste Pernambucano

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Abstract

Since the first report of an association between antigen A and the increased risk of stomach cancer, several studies have evaluated the involvement of the ABO blood group in cancer pathogenesis. Based on this hypothesis, this study aimed to identify blood typing as a risk factor for the development of breast cancer in a female population attended at the Oncology Center of Caruaru (CEOC) in Pernambuco. The 'case' group (n=50) was comprised of female patients diagnosed with breast cancer with a serologically confirmed ABO blood group. The 'control' group (n=50) was obtained from electronic medical records of patients without a diagnosis of cancer, with the same age. The frequency of distribution of blood groups was compared between cases (48% O, 40% A, 12% B, and 0% AB) and controls (44% O, 40% A, 14% B, and 2% AB). The findings of this study showed that there was no significant association between breast cancer and ABO blood group ($p>0.05$), in addition to the fact that no significant differences in clinical characteristics were observed between patients with different types of ABO blood.

Keywords: Blood typing. Breast cancer. ABO system. Risk factor.

INTRODUCTION

Antigens A and B are carbohydrates synthesized by the action of specific glycosyltransferase enzymes, encoded in the ABO locus positioned on chromosome 9q34. In addition to being present on the surface of red blood cells, antigens from the ABO blood group system are also expressed by several human cells and tissues, including breast duct cells, lobular cells, and even some malignant cells[1]. Several studies in cancer biology have suggested an association between ABO blood antigens and an increased risk of developing neoplasms in solid and hematological organs[2-4].

According to data from the National Cancer Institute - INCA, in 2018, among the types of cancer, Breast Cancer (BC) stands out with the highest frequency and mortality in the female population worldwide, excluding non-melanoma skin cancers. About 59,700 new cases of breast cancer were expected for Brazil

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for each year of the 2018-2019 biennium, with an estimated risk of 56.33 cases per 100,000 women. The estimate for the state of Pernambuco was 2680 new cases[5].

The etiology of breast cancer is multifactorial, among the main known risk factors that stimulate the predisposition to breast cancer is associated with age, early menarche, late menopause, nulliparity, obesity, family history of BC, mutation in the BRCA1 and/or BRCA2 genes, among others[6]. Although it has been observed that the risk of diffusely infiltrating stomach cancer is 20% higher in people with blood type A when compared to type O, the relationship between blood group and risk of breast cancer and prognosis remains controversial[7].

Many studies have documented a relationship between blood types and the incidence and prognosis of breast cancer[8,9]. However, other reports have found no association between susceptibility to breast cancer[10,11]. Thus, the present study aims to verify the association between blood type and the presence of breast cancer in a population served at the Oncology Center of Caruaru (CEOC) in Pernambuco.

MATERIAL AND METHODS

A case and control study was carried out. The cases (n=50) consisted of female patients diagnosed with breast cancer and who underwent treatment or follow-up at the Caruaru Oncology Center (CEOC) in Pernambuco. The controls (n=50) were obtained through the electronic medical records of patients without a diagnosis of cancer, with the same age, at the transfusion agency of the Hospital Regional do Agreste (HRA).

The venous collection of the blood sample of the case group was stored in an EDTA tube (5 ml) and the blood types of these patients were obtained through the EBRAM blood classification test[12], from June to November 2018. Other factors such as age, menopausal status, and family history of cancer were retrieved from medical records. In cases where the information was incomplete, a telephone contact was made to clarify doubts. All information regarding the control group was acquired through consultation of electronic medical records. Patients who received a bone marrow transfusion or transplant in less than two months were excluded from the study.

The statistical analysis of the data was performed through the website for statistical computing, Vassarstats. To estimate the relative risk (RR) associated with the blood type, odds ratios (OR) were calculated, with a 95% confidence interval. Differences in the distribution of variables between the control group and cases group were assessed using Fisher's exact test. The project was approved by the Research Ethics Committee of ASCES-UNITA (opinion number: 2.699.768).

RESULTS

The characteristics of the studied population are shown in table 1. Breast cancer (BC) patients had an average age of 55.24 years, with a minimum age of 34 and a maximum age of 92 years, however, 58% were older than 50 years old. The average age in the control group was 60.8 years, with a minimum age of 34 and a maximum age of 93 years.

Regarding the menopausal status of the patients, the vast majority of the cases and controls (78%) were in menopause. Regarding the presence of a first-degree family history of cancer, we found that the vast majority of patients with breast cancer (74%) had a previous history of relatives with some type of cancer.

The frequency of distribution of the blood type in the total population studied (case and control groups) was 46% for type O, 40% for type A, 13% for type B, and 1% for type AB.

Assessing BC patients separately according to their blood group, it was possible to observe that 48% (24 patients) corresponded with type O, followed by 40% (20 patients) with type A, 12% (06 patients) with type B, and 0% with blood type AB.

The distribution of blood types found in the control group was similar to the case group, 44% (22 people) were type O, 40% (20 people) were type A, 14% (07 people) were type B, and 02% (01 person) were type AB, (table 1).

Table 2 shows the clinical characteristics of breast cancer patients with different types of ABO blood. There was no positive correlation between age, menopausal status, family history of cancer, and ABO blood group (p> 0.05).

Table 3 shows that there was no statistically significant association between the different types of the ABO blood with breast cancer.

Table 1– Characteristics of the studied population.

Characteristics	Case Group (patients with BC) (n=50)	Control Group (n=50)
Age		
≤50	21 (42%)	11 (22%)
>50	29 (58%)	39 (78%)
Menopause		
Yes	39 (78%)	39 (78%)
No	11 (22%)	11 (22%)
Family history		
Yes	37 (74%)	NA
No	13 (26%)	
Blood Group		
A	20 (40%)	20 (40%)
B	06 (12%)	07 (14%)
AB	00 (00%)	01 (02%)
O	24 (48%)	22 (44%)

NA= Not applicable. Caruaru, 2020.

Table 2– Characterization of patients with BC by blood type.

Blood group	A	P value	B	P value	O	P value
Nº	20		06		24	
Age						
≤50 >50	07 (65%) 13 (35%)	p= 0.3	04 (66.7% 02 (33.3%)	p= 0.19	10 (41.7%) 14 (58.3%)	p= 0.59
Menopause						
Yes No	17 (85%) 03 (15%)	p= 0.26	05 (83.3%) 01 (16.7%)	p= 0.60	17 (70.9%) 07 (29.1%)	p= 0.20
Family history						
Yes No	16 (80%) 04 (20%)	p= 0.32	03 (50%) 03 (50%)	p= 0.17	18 (75%) 06 (25%)	p= 0.56

Caruaru, 2020.

Table 3– Association of the ABO blood type with breast cancer.

Blood Group	Case Group (n=50)	Control Group (n=50)	P value	OR	95% Confidence interval
Blood Type A Others (B, AB and O)	20 30	20 30	p> 0.05	1.0	0.44-2.22
Blood Type B Others (A, AB and O)	06 44	07 43	p> 0.05	1.19	0.37-3.84
Blood Group AB Others (A, B and O)	00 50	01 49	p> 0.05	NA	NA
Blood Type O Others (A, B and AB)	24 26	22 28	p> 0.05	0.85	0.38-1.87

NA= Not applicable.

Caruaru, 2020.

DISCUSSION

The first report describing a relationship between antigen A and the increased risk of stomach cancer was published in 1953; since then, several studies have evaluated the involvement of the ABO blood types in the pathogenesis of many human disorders, including cardiovascular disease and cancer[13-16].

The findings of this study showed that the distribution of the ABO blood types in patients with breast cancer was similar to that of the healthy population and there was no positive correlation between age, menopausal status, family history of cancer, and ABO blood group. This was also observed by Aly *et al.* (2014)[17] in Egypt, where they evaluated 160 patients with breast cancer as well as by Akin and Altundag (2018)[18] in a national cohort of 3,944 patients with breast cancer in Turkey. Both found no correlation between the patient's clinical characteristics and blood type.

Although the underlying biological mechanisms that associate the ABO blood system with cancer remain uncertain, possible explanations involve the modified expression of blood group antigens on the surface of cancer cells, which can alter cell motility, sensitivity to apoptosis and immune evasion, with important implications for malignant progression[19]. Moreover, this may be involved in the regulation of circulating levels of various pro-inflammatory molecules (tumor necrosis factor-alpha) and adhesion molecules (i.e., soluble E-selectin, P-selectin, and intercellular adhesion molecule-1), suggesting the participation of these antigens in the systemic inflammatory response, a potential mechanism for the risk of cancer[20].

The associations between the ABO blood type and the risk of breast cancer, in different studies, present conflicting results. Our findings show that there was no statistically significant association between the ABO blood group and breast cancer. Results obtained from a study by Yu *et al.* (2012)[21] reveal that triple negative breast cancer (worse prognosis) was not associated with a specific ABO blood type. Gates et al. (2012)[22] in a case-control analysis of 1138 patients with invasive breast cancer also found no association between the ABO type and the incidence of any breast cancer subtype, including invasive, ductal, or hormone receptor tumors. In addition, Flavarjani *et al.* (2014)[23] concluded that blood type cannot be considered a risk factor for the development of breast cancer, when comparing Isfahan women with breast cancer (invasive ductal or lobular, medullary, and Paget's disease) with a healthy population.

However, other studies support significant associations between blood type and the risk of breast cancer[24-27]. The plausible reasons for the disparity between the results include heterogeneity in the characteristics of the populations, limited study sizes, and differences in the ABO distribution[21].

The limitations of this study were the sample size, which was by convenience, as it was not possible to obtain the estimated prevalence of patients with breast cancer and proceed with the sample calculation and the lack of clinicopathological information such as histology, tumor size, nodal involvement, and metastasis, which would be necessary data to assess the associations between blood types and the prognosis of patients with breast cancer.

To our knowledge, this was the first study that evaluated the association between ABO blood type and breast cancer in a population in the countryside of Pernambuco, a factor that may incite interest in deeper studies with these types of patients in the area.

CONCLUSION

Some publications have raised hypotheses about blood type involvement as a risk factor for the development of some types of cancer. Despite being controversial, studies have revealed the existence of an association between blood type and the presence of cancer. Based on this hypothesis, this study was carried out with female patients with breast cancer treated by an oncology center (CEOC) located in Caruaru, in Agreste Pernambucano.

This was a case-control study (n=100) composed of women only. Patients in the 'cases' group (n=50) had a previous cancer diagnosis and had their blood type tested by the body proposing the study. The electronic medical records of patients in the control group (n=50) were checked for their blood type and exclusion from the diagnosis of breast cancer.

The findings of this study showed that there was no significant association between breast cancer and ABO blood type, in addition to no significant differences in clinical characteristics between patients with different types of ABO blood. However, more large-scale, prospective, multicentric, and controlled studies are needed for possible clarifications.

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