Incidence of Breast Cancer in a Primary Hospital in Relation to ABO Blood Groups System

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***Abstract*—The aim of this study was to investigate the association of ABO blood group system with breast cancer in a primary hospital in Penang. Moreover the study was conducted to assess the utility of ABO blood group as a preclinical marker. The study sample consisted of 70 and 140 cancer and controlled subjects respectively. Factors such as blood group, age, ethnic group were examined in 70 female subjects of breast cancer. Blood samples were taken from 140 healthy subjects to examin the distribution of ABO blood group types with different Malaysian races. Incidence in cancer patients is high with blood group A and AB compared with control group; however the association was not statistically significant. For blood group B and O were lower in cancer patients compared to control healthy group and the association was statistically significant. The results also indicated that blood type should be considered along with other risk factors to understand the patient's risk. Conclusion: Blood group A is highly associated with breast cancer (30.0%), in contrast to the other blood groups.**

***Index Terms*—ABO blood group, breast cancer, ethnic group**

I. INTRODUCTION

Blood group antigens being the major antigen in humans are present on the surface of red blood cells and various epithelial cells. As the majority of human cancers are derived from epithelial cells, changes in blood group antigens are an important aspect of human tumor [1]-[4]. In some tumors, alteration of ABO/Lewis-related antigens is associated with malignant transformation [5], [6].The ABO blood type, an easily accessible factor in patient's genetic makeup, has been associated with many diseases, though the explanation for the association between ABO blood groups and some disease is still unclear. Since the first report showing an association between blood group A and gastric cancer [7], numerous other reports have documented a relation between susceptibility to cancer and blood group. High incidence of blood group A in various cancers, including neurologic tumors, salivary gland, colon, uterus, ovary, pancreas ,kidney, bladder and cervix [8], and consistent relation to O blood group in skin and melanoma [9] has been reported.ABO blood group genes are mapped at 9q34.2 region in which genetic alteration is common in many cancers. Thus, blood group antigen expression may be affected by genetic change of tumor. A correlation of blood group antigen expression in tumor with metastasis and prognosis has been reported for various human malignancies,such as, colon, breast and prostate cancer as the blood group carbohydrates expressed on cell surface of metastatic cancer cells function as cell adhesion molecules. The loss or presence of blood group antigens can increase cellular motility or facilitate the interaction between tumor cells and endothelial cells of distant organs [10]-[13]. In many cancers, the deficiency of A or B epitope has been reported which is associated with accumulation of their precursor, which causes enhanced malignancy, though the molecular genetics mechanism leading to such phenotypic changes is not known. The expression of certain blood group carbohydrate antigens on the surface of cancer cells thus can be regarded as an end product of tumor progression that can be used as useful prognostic and diagnostic markers [14]-[16].The ABO blood group distribution varies in different geographical and ethnic groups, and socio-economic groups [17].There is a contrary result, in some cancers the absence of any significant association with blood group has been demonstrated, cancer of the lung, cancer of the breast and cancer of the colon and rectum. For example; in this connection Fraser Roberts has reminded us of Sir Henry Dale's warning that the growth of the dinosaurs would have shown no statistical significance even over several generations of human observation if there had been trained human observers then to record it. The absence of different disease incidences between the blood groups, moreover, does not exclude the blood groups from participation in disease processes. They may be equally concerned with protection against, or predisposition to, a disease in which no group difference is demonstrable. According to the national cancer registry, Malaysia 2003, breast cancer is ranked as the commonest cancer in the female population, consisting of 31.5 % of all female cancers aged 50-64 years and 38.9% of all female cancers aged 15-49 years [18]. The highest frequency of breast cancer is between the ages of 40-59 years. Penang cancer registry report demonstrated breast cancer as the leading cancer in female, comprising 30.9% of female cancers .The Chinese had the highest incidence

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per 100,000 populations, followed by Indians and Malays [19].

II. Materials and Methods

The data of age, gender, ABO and Rh blood group type of cancer patients were collected from Hospital Kepala Batas, Penang. The samples of healthy control group were collected from the blood bank. A total of 70 females with breast Cancer and 140 healthy controls (45 males and 95 females) were assessed for the association with ABO blood groups. The blood group frequencies were compared using Chi- -square test. The study was approved by the Ethics Committee of the Advanced Medical and dental Institute Universiti Sains Malaysia. All the patients and healthy control subjects are to be involved voluntarily in this study. Control subjects were selected among healthy people with no history of cardiovascular disease, cancer, chronic degenerative neurologic disease, chronic obstructive pulmonary disease, hepatitis, allergies in general or alcohol abuse. Blood samples were obtained from each donor's venous circulation into vacuum tubes containing EDTA. ABO and Rh blood typing were carried out with gelmethod. Gel method: 5% RBC suspension was prepared in diluents (modified bromelin solution for red cell suspensions). Gel cards (Diaclon ID, Diamed AG, Cressier, Switzerland) were used for ABO and Rh typing. 12.5 µL of RBC suspension was added to the gel microtubes containing anti-A, anti-B, anti-D, and control reagents, respectively. 50 µL of donor plasma were added to microtubes for reverse ABO group testing. The ID cards were centrifuged at 895 rpm 10 minutes in ID-centrifuge 6S (Diamed Ag, Switzerland). A positive reaction (4+) was determined by the formation of a red line on the gel surface, whereas intermediate reactions were characterized by red agglutinates distributed throughout the gel. With a negative reaction, a compact button of cells formed on the bottom of the microtube. Data were collected and statistical analysis was performed according to Statistical Package for Social Science (SPSS) version 12.0.1and probability values below 0.05were considered statistically significant. The sample size was calculated using Ps power and sample size programme for independent case control study. Power of study was 80% while Confidence intervals (CI) were ninety five percent.

III. Results

In this study we found that there was an association between blood groups A and AB with breast cancer in The sample population. The frequency of ABO groups of the 70 breast cancer patients and healthy control subjects is shown in Table I. In breast cancer high frequency of the blood group A (30.0%) followed by O (27.1%), B (24.3%) and AB (18.6%), in control group O (42.1%) followed by B (25%), A (21.4%) and (AB (11.4%) was seen. The frequency of Cancer incidence was significantly high in blood group A, while Blood Group O had lower incidence of cancer as compared to controlled subjects. All patients and control samples were +ve for Rh blood group. The ages of Patients and healthy control subjects were between 17- -70 years. The present results reveals relationship between Age and breast cancer in primary hospital samples .The higher breast cancer was detected in old age (>45 years), while no cases of breast cancer were detected in young age group (< 30 years) as shown in Fig. 1. The distribution of ABO blood group antigen varies in different ethnic groups as shown in Fig. 2, and blood group distribution among different Races (breast cancer patients) shown in Fig. 3. The result of present study showed that most of The control subjects and patients were Malays followed by Chinese and Indian.

TABLE I. Association of Abo Blood Group with Breast Cancer

Blood group	Patients No. %	Control No. %	χ^2 test Patients vs. Controls	*P* value
A	21 (30.0%)	30 (21.4%)	1.588	0.208
B	17 (24.3%)	35 (25.0%)	6.231	0.013
AB	13 (18.6%)	16 (11.4%)	0.31	0.577
O	19 (27.1%)	59 (42.1%)	20.513	< 0.001

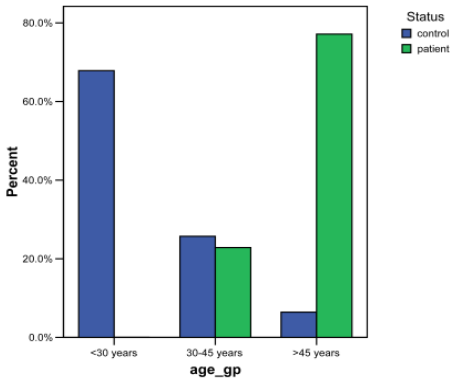

Figure 1. Distribution of breast cancer in different age group

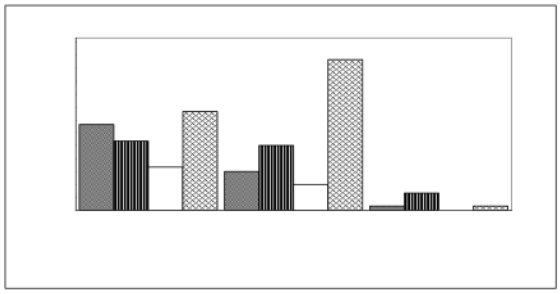

Figure 2. Blood group distribution among ethnic groups (control group).

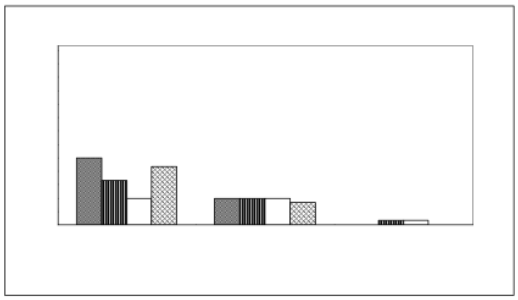

Figure 3.Blood group distribution among ethnic groups (patients group).

IV. Discussion

Despite advances in early detection and the understanding of the molecular bases of breast cancer biology, about 30% of patients with early-stage breast cancer have recurrent disease. To offer more effective and less toxic treatment, selecting therapies requires considering the clinical and molecular characteristics of the tumor. Systemic treatment of breast cancer includes cytotoxic, hormonal, and immunotherapeutic agents. The role of genetic factors in the development of cancer is widely accepted. During The last two decades, the role of inheritance in breast tumor genesis has been clearly established. A study performed By Guleria [20] showed that group A was significantly associated with breast cancer when compared to control. In study of rapidly progressive breast cancer in Tunisian women by Mourali [21] included 581 of the breast cancer patients. A positive risk was reported in blood group A patients. In Iceland a study in 1988 looked at the risk of bilateral breast cancer in 184 familial and 572 sporadic cases with regard to ABO typing. Familial cases of bilateral breast cancer had twofold higher prevalence of type B than did sporadic cases [22]. The increased rate of Blood type A as compared to controls has been reported by other researchers In breast cancer patients [23].They suggested that the effect of Blood type A on breast cancer development was capable of being masked by the effect of breast cancer susceptibility genes and/or That the inherited or non‐‐inherited types involve different etiologic mechanisms. A high risk of early death in breast cancer patients with blood groups B and AB, with AB having greater local Recurrence risk has been reported [24]. Whereas, a study conducted by Irs [25], where one thousand women with carcinoma of the breast had been followed by the Tumor Registry and the blood groups had been determined. Data showed that; 44.7% had type O blood; 41.3% type A blood; 11.1%, type B blood; and 2.9% type AB blood group. The close approximation to The control group distribution of blood groups makes it obvious that there was no relation between blood group and carcinoma Of the female breast. Tsukada et al., [26] conducted a study on blood groups in patients with breast cancer. The subjects were 310 cases (198 males and 112 females). Their findings suggested Null relationship between the blood type and the breast cancer patients. A study done by Sharma et al., [27] on 368 of cancer patients, 126 of them were breast cancer patients, the study revealed that in the cases of the breast cancer there was no clear relationship between ABO blood group antigen and breast cancer. ABO blood group genes are mapped at 9q34.2 region in which genetic alteration is common in many cancers. Thus, blood group antigen expression may be affected by genetic change of tumor. A correlation of blood group antigen expression in tumor with metastasis and prognosis has been reported for various human malignancies, such as, breast colon, and prostate cancer as the blood group carbohydrates expressed on cell surface of metastatic cancer cells function as cell adhesion molecules [20].

V. Conclusion

In conclusion, evidence for association of blood groups with breast cancer is controversial, some blood groups showed positive association and others were negative. It appears that different blood groups are associated with breast cancer; Blood group A apparently increases the risk for cancer. Breast cancer has the strongest association with blood type A. The racial and Ethnic distribution of blood groups and size of sample is an important factor for predicting the cancer risk. Blood type needs To be considered together with other risk factors to understand

The individual patient's risk. The identification of genetic and Environmental factors among racial and ethnic groups should offer some insights into the observed epidemiological data and advance opportunities to better understand the control and development of cancer.

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