

## ABO Blood Groups in Gastrointestinal Tract (GIT) and Breast Carcinoma Patients

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**ABSTRACT** The ABO blood group distribution varies in different geographical and ethnic groups. In Punjab (India), the ABO blood frequency is B>O>A>AB. The current study was an attempt to correlate the ABO blood group frequency with preponderance of breast and gastrointestinal cancer in Punjab, to assess the utility of ABO blood group as a preclinical marker. The study sample consists of 160 cancer patients and 160 controls. In cancer patients, the incidence of A and B groups was significantly higher compared to controls. In breast cancer, the frequency of A group was significantly higher and in oesophageal cancer, the frequency of B group was significantly higher. The results indicate that blood type should be considered along with other risk factors to understand the individual patient's risk.

### INTRODUCTION

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 (Arid et al., 1953), 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 (Henderson et al., 1993), and consistent relation to O blood group in skin and melanoma (Karakousis et al., 1986) 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 (Pack et al., 1999; Hu et al., 2000; Simoneau et al., 2000; Zitzelsberger et al., 2001). 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 genetic 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 (Ichikawa et al., 1998; Quan et al., 1999; Sleeman et al., 1999; Le Pendu et al., 2001).

The ABO blood group distribution varies in different geographical and ethnic groups, and socio-economic groups (Beardmore et al., 1983). In India, the ABO blood group frequency is variable, the frequency for B ranges from 6% in negritos of Andamans to 48% in Birijas of Bihar while A group is 20-30% in Western and Eastern Himalayas (Barua, 2002). The blood group frequency in North India is B>O>A>AB (Bhasin et al., 1992). The state of Punjab in North India is inhabited by a mixed population of Caucasian and Indoscythian racial stock, and the blood group frequency in Punjab is B (34-39%)>O (30.0-31.5%)>A (20%)>AB (7.8%) (Bhasin et al., 1992).

Carcinoma of gastrointestinal tract (GIT) and breast is a common malignancy in North India, especially in Punjab. Previous study from Punjab has reported a preponderance of blood group O in stomach and liver cancer but no significant susceptibility of a person to a particular group of cancer (Rai et al., 1972). The current study was

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an attempt to correlate ABO blood group frequency with preponderance of breast and GIT cancer in this region to assess the utility of ABO blood group as a preclinical marker.

### MATERIAL AND METHODS

The data of age, sex, ABO blood type and pathological status of cancer patients were collected from various hospitals at Patiala and Amritsar cities of Punjab (India). The two cities are located 210 km. apart. The control sample was collected from the blood bank donors. A total of 160 cancer patients (59 males and 101 females) and 160 healthy controls (72 males and 88 females) were assessed for the association with ABO blood groups. The blood group frequencies were compared using Chi-square test.

### RESULTS

The frequency of ABO blood group types of 160 cancer patients (59 males and 101 females) and 160 control individuals (72 males and 88 females) is given in Table 1. When all cancers were taken together, the highest frequency of blood group B (41.8%), followed by blood group A (30%), O (16.9%) and AB (10.6%) was seen in cancer patients. In control samples, high frequency of blood group B (47.5%), followed by O (30.0%), A (13.8%) and AB (8.8%) was seen. The frequency of A group was significantly higher and O group was significantly lower in cancer patients as compared to controls. When

**Table 1: Blood group distribution in cancer patients and controls**

Type	No. of subjects	A+	B+	AB+	O+
Controls	160	22 (13.8)	76 (47.5)	14 (8.8)	48 (30.0)
Breast	42	15 (35.7)	8 (19.0)	7 (16.6)	12 (28.5)
Oeso- phageal	43	9 (20.9)	19 (44.1)	7 (16.2)	8 (18.6)
Gastric	8	1 (12.5)	5 (62.5)		2 (25.0)
Colon	12	3 (25.0)	8 (66.6)	1 (8.3)	
Rectum	10	4 (40.0)	4 (40.0)		2 (20.0)
Caecum	2	1 (50.0)	1 (50.0)		
Intestine	4	1 (25.0)	3 (75.0)		
Anal	3	1 (33.3)	1 (33.3)	1 (33.3)	
Liver	10	5 (50.0)	5 (50.0)		
Pancreas	8	2 (25.0)	4 (50.0)		2 (25.0)
Gall bladder	11	3 (27.2)	6 (54.5)	1 (9.0)	1 (9.0)
Geni- tourinary	7	3 (42.8)	4 (57.1)		

Figures in parentheses represent frequency of blood group

different types of cancers were assessed, among GIT cancers high frequency of blood group B (49.5%), followed by group A (27.0%), O (13.5%) and AB (8.1%) was seen. In oesophageal cancer, high frequency of blood group B (44.1%), followed by group A (20.9%), O (18.6%) and AB (16.2%) was seen. In breast cancer patients, high frequency of blood group A (35.7%), followed by blood group O (28.5%), B (19.0%) and AB (16.6%) has been observed. The frequency of A and B groups was significantly higher in breast cancer patients and oesophageal cancer patients, respectively (Table 2).

### DISCUSSION

In cancer patients, the incidence of A group was higher in both breast and GIT cancer patients, though when all cancers were taken together the incidence of B blood group was highest, followed by A group, whereas in controls, B and O groups were in higher frequency.

In previous studies, contradictory reports are available about the association of blood group with breast cancer, as increased B group or A group in breast cancer patients has been reported. No relation of breast cancer to any blood group (Jayant et al., 1971), increased B and O group (Tyagi et al., 1965) and increased B group (Surekha et al., 2004) in breast cancer patients has been reported. A study of rapidly progressive breast cancer in Tunisian women found a slightly increased risk of a positive diagnosis in blood type A. In breast cancer patients, high frequency of blood group A (35.7%), followed by group O (28.5%), group B (19.0%) and group AB (16.6%) was seen (Mourali et al., 1980). The increased rate of blood type A as compared to controls has been reported in breast cancer patients (Anderson and Hass, 1984). The results suggest 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 (Holdsworth et al., 1985). Higher prevalence of blood group B in familial case of breast cancer than sporadic cases has been reported, supporting

**Table 2: Comparison of blood group frequency in different cancers**

Blood group	Patients	Controls	$\chi^2$ test Patients vs Controls	Significance	GIT cancers	Breast cancer	Oesophageal cancer	$\chi^2$ test Breast vs GIT	Significance	$\chi^2$ test Breast vs Oesophageal	Significance
A	48 (30.0)	22 (13.8)	7.91	p < 0.05 Significant	30 (27.0)	15 (35.7)	9 (20.9)	2.15	p > 0.05 Non-significant	3.53	p > 0.05 Non-significant
B	67 (41.8)	76 (47.5)	0.60	p > 0.05 Non-significant	55 (49.5)	8 (19.0)	19 (44.1)	24.19	p < 0.001 Highly significant	17.57	p < 0.001 Highly significant
AB	17 (10.6)	14 (8.8)	0.27	p > 0.05 Non-significant	9 (8.1)	7 (16.6)	7 (16.2)	4.05	p < 0.05 Significant	0.14	p > 0.05 Non-significant
O	27 (16.9)	48 (30.0)	4.74	p < 0.05 Significant	15 (13.5)	12 (28.5)	8 (18.6)	6.31	p < 0.05 Significant	1.53	p > 0.05 Non-significant

Figures in parentheses represent frequency of blood group

the presence of a genetic factor in the etiology of familial breast cancer (Trygvadottir et al., 1988).

In Genitourinary, Liver, Pancreatic and Gall bladder cancer patients, high frequency of blood group B (~50%) was seen but sample size was small. The increased number of pancreatic cancer among the patients with blood group B and a decreased number in patients with blood group O as compared to control have been reported (Annese et al., 1990). Another study has suggested the positive association with A blood group in pancreatic cancer and slight association with A in liver cancer and in gall bladder and bile duct cancers strong associations with A and B (Vioque et al., 1991).

In oesophageal cancer patient, high frequency of blood group B (44.1%), followed by group A(20.9%) and O (18.6%) was observed. In oesophageal cancer, the association between blood group A and B (Mourant et al., 1978) and increased incidence of B blood group have been reported (Su et al., 2001).

In gastric, intestinal, colon carcinoma sample size was small but increased B blood group was observed. In gastric carcinoma a consistent association with A group and a protective influence of O group in long-term survival have been reported (Beckman et al., 1987). The mechanisms hypothesized behind the association between blood group A and gastric carcinoma is that the carcinoma cells produce an antigen immunologically related to blood group A which particularly in O individuals may have a protective effect by preventing the growth and

spread of the tumor. Because of this similarity, antibodies to A probably also attack precancerous and cancerous cells expressing this antigen. The homotypic and heterotypic cell adhesion mediated by interactions of certain blood group carbohydrates with corresponding lectins is a critically important event at the extravasation step of the metastatic cascade when metastatic cancer cells escape from circulation into distant sites of secondary tumor growth. People with blood groups A and AB lack antibodies to A and so are more prone to develop these carcinomas (Henderson et al., 1993). The authors also propose that there is a small association between blood type A and cancer development. Type A individuals appear to be at a moderately increased risk for many cancers. Deletion or reduction of histo-blood group A or B antigen in tumors of A or B individuals is correlated with the degree of malignancy and metastatic potential in many types of human cancers. The expression of histo-blood group A antigen has been reported to increase resistance to apoptosis and facilitate escape from immune control in rat colon carcinoma cells (Marionneau et al., 2002). In colon cancer, a weak association with A group and an altered blood group antigen expression related to progression of malignancy has been reported (Itzkowitz, 1992).

In conclusion, it appears that different blood groups are associated with different manifestations of the disease. Blood group A apparently increases the risk for cancer. Breast cancer has the strongest association with blood type A and

oesophageal cancer has association with B blood group. The other cancers show various risk or lack of risk associated with blood group. But 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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