Section: Transfusion Medicine

Original Research Article

DISTRIBUTION OF ABO AND RH BLOOD GROUPS AMONG PATIENTS WITH NEO-PLASTIC DISORDERS

M. S. Suma[1], Chitra James[2], Lakshmi L Rajan[3], Kala V L[4], Jyothis P[2]

[1]Associate Professor, Department of Transfusion Medicine, Medical College, Kottayam, Kerala, India
[2]Assistant Professor, Department of Transfusion Medicine, Medical College, Kottayam, Kerala, India
[3]Associate Professor, Department of Transfusion Medicine, Medical College Kozhikode, Kerala, India
[4]Associate Professor, Department of Transfusion Medicine, Medical College Thiruvananthapuram, Kerala, India

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Corresponding Author:
Dr. Lekshmi L Rajan
Email: lekshmraj@gmail.com

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Abstract

Background: There is a large amount of evidence that the ABO blood group system may play a role in disease etiology. A relationship between ABO and Rhesus blood groups and cancer risk has been demonstrated in a number of studies. The objectives are to investigate the distribution of ABO and Rh blood group in neoplastic disorders and exists can be used as a preclinical marker for cancer development and risk. **Materials and Methods:** The present study entitled as "distribution of ABO and Rh blood group in Neoplastic disorders was carried out in Department of Tranfusion Medicine at Government Medical college, Kottayam between January, 2019 and January, 2021 (2-year study records). This was a retrospective record-based study having clinical and hypothesis testing with research design included the patients attending outpatient department (OPD)/ transfusion OPD with carcinoma of GIT, Breast, CNS, Blood and Lymphatics, endocrine, skin, genitor-urinary, musculoskeletal total of 1503 in number of any age group of both genders. All relevant patient data were recorded. SPSS was used for analysis. **Result:** The study was female preponderance comprising 51% of patients while males were 49% and it was found to be statistically significant. The most common neoplastic disorders seen belonged to GIT (34%), followed by Genito-Urinary neoplasm in 20% which was found to be statistically significant ($p<0.05$). Blood and Lymphatics include 13%, while Ca Breast seen among 10% of females. 7% of respiratory neoplasm and 6% of CNS neoplasm were also recorded during the study out of total 1503 patients. ABO and Rh (+) was seen in 94% of patients (1410) while Rh (-) was seen in 6% of patients (93). Among ABO the most common blood group was O+ seen in 40% of patients followed by B+ seen in 27% of patients. **Conclusion:** The present study revealed that there are significant associations between ABO and Rh blood group and patients with neoplastic disorders. These findings also raise the possibility of using blood groups as an epidemiological marker for identifying population subgroups who are at high risk of these neoplasms.

INTRODUCTION

ABO antigens are regarded as red blood cells antigens but they are also expressed on a variety of human tissue and are present on most of endothelial and epithelial cells. Other blood cells such as T-cells and platelets have ABO blood group antigens that have been adsorbed from plasma. Individuals known as secretors, a soluble form of ABO blood group antigens is found in saliva and in all body fluids except cerebrospinal fluid.[1] number of illnesses may alter a person's ABO phenotype, for example, patient can acquire the B antigen during a necrotizing infection. Different blood groups have been shown to be associated with different disease as well.[2] Knowing the causes of cancer provides a basis of understanding the potential for preventing cancers. In India and western countries, research has been carried out to find relation between ABO blood group and various systemic diseases which shows diseases such as peptic ulcer, dental caries, salivary gland tumors, chicken pox, malaria, oral cancer, hematological malignancies, ischemic heart

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diseases, and had significant association.[3] High incidence of blood Group A consisted with gastric cancer, neurological tumors, salivary gland, colon, ovary, kidney, and cervix. O blood group consisted with skin malignancy and melanoma. The relationship between the epidemiological determinants such as gender, race, geographical location, and various hematological malignancies are well known.[4] However, association between blood groups and these malignancies are not well established. If the risks of these malignancies are known, for the different ABO blood groups, then it could be used as an epidemiological marker to identify high-risk population. The present study is an attempt to correlate ABO and Rh blood group frequency with preponderance of various neoplastic disorders to assess the utility of ABO and Rh blood group as a preclinical marker.

MATERIALS AND METHODS

The present study entitled as "distribution of ABO and Rh blood group in Neoplastic disorders was carried out in Department of Tranfusion Medicine at Government Medical college, Kottayam between January, 2019 and January, 2021 (2 year study record). This was a retrospective record-based study for 2 years having clinical and hypothesis testing with research design included the patients attending outpatient department (OPD)/ transfusion OPD with carcinoma of GIT, Breast, CNS, Blood and Lymphatics, endocrine, skin, genitor-urinary, musculoskeletal total of 1503 in number of any age group of both gender.

Blood groups of those specific patients have been obtained from blood bank; Patients were followed up to final confirmation of diagnosis. All relevant patient data were recorded. Patients having confirmed diagnosis elsewhere attending to hematology/medicine outpatient were also included in the study and sample for blood grouping was done in our blood bank.

A well-informed written consent was obtained from all participants in language understood by patients.

Under aseptic condition with a disposable syringe blood sample was collected from accessible peripheral vein in ethylenediaminetetraacetic acid and plain vial (1.5 ml in each vial). Sample vial will be labeled with sample number and name of the patient sample details including age, gender, residential address, contact number of donors, clinical details, and diagnosis of patient was noted on performa. ABO and Rh blood grouping was done using slide agglutination method and gel card technology.

Statistical Analysis

The statistical analysis was performed using SPSS for windows version 22.0 software (Mac, and Linux). The findings were present in number and percentage analyzed by frequency, percent, and Chi-squared test. Chi-squared test was used to find the association among variables. The critical value of P indicating the probability of significant difference was taken as <0.05 for comparison.

RESULTS

As per [Table 1] the study was female preponderance comprising 51% of patients while males were 49% and it was found to be statistically significant. The most common neoplastic disorders seen belonged to GIT (34%), followed by Genito-Urinary neoplasm in 20% which was found to be statistically significant ($p<0.05$). Blood and Lymphatics include 13%, while Ca Breast seen among 10% of females. 7% of respiratory neoplasm and 6% of CNS neoplasm were also recorded during the study out of total 1503 patients.

Table 1: Distribution of patients as Gender and Neoplastic disorders

Variables	Number	Percentage (%)	p-value
Males	733	49	0.01*
Females	770	51	
Neoplastic disorders			
GIT	509	34	0.01*
Genito-Urinary	303	20	0.01*
Blood and Lymphatics	198	13	0.01*
CNS	84	6	0.23
Breast	179	10	0.11
Respiratory	117	7	0.45
Endocrine	98	5	0.21
Skin	20	2	0.114
Musculoskeletal	20	2	0.34
Salivary	4	1	0.44
Total	1503	100	

Table 2: Distribution of ABO and Rh blood groups in patients

Blood group	Number	Percentage
ABO and Rh (+)	1410	94
O+	563	40
A+	361	25
B+	389	27
AB+	97	7
Rh (-)	93	

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O-	40	43
A-	23	27
B-	27	29
AB-	03	1

As per [Table 2] out of 1503 patients, ABO and Rh (+) was seen in 94% of patients (1410) while Rh(-) was seen in 6% of patients (93). Among ABO the most common blood group was O+ seen in 40% of patients followed by B+ seen in 27% of patients. Among Rh (-) O- was most common seen in 43% of patients.

Table 3: Association of ABO and Rh blood group with Neoplastic disorders

Blood group	Neoplasm	Number	p-value
O+ (563)	Ca stomach	28	0.001*
	Ca breast	63	
	Ca pancreas	10	
	Ca anal canal	4	
	Ca rectum	33	
	Ca colon	37	
	Ca buccal mucosa	6	
	Ca caecum	2	
	Ca prostate	7	
	Ca ovary	24	
	Ca bladder	41	
	Ca cervix	17	
	Ca endometrium	5	
	RCC	23	
	Ca Ub	1	
	Blood and Lymphatics	77	
	CNS	43	
	Respiratory (BCC)	80	
	Endocrine	50	
	Skin	7	
	Muskuloskeletal	5	
A+ (361)	Ca stomach	22	0.001*
	Ca breast	45	
	Ca pancreas	3	
	Ca anal canal	1	
	Ca rectum	22	
	Ca colon	26	
	Ca buccal mucosa	4	
	Ca caecum	2	
	Ca prostate	7	
	Ca ovary	17	
	Ca bladder	8	
	Ca cervix	8	
	Ca endometrium	6	
	RCC	15	
	Ca Ub	2	
	Blood and Lymphatics	43	
	CNS	32	
	Respiratory (BCC)	57	
	Endocrine	12	
	Skin	1	
	Muskuloskeletal	1	
B+ (389)	Ca stomach	23	0.01*
	Ca breast	68	
	Ca pancreas	8	
	Ca anal canal	2	
	Ca rectum	24	
	Ca colon	28	
	Ca buccal mucosa	10	
	Ca caecum	5	
	Ca prostate	6	
	Ca ovary	18	
	Ca bladder	3	
	Ca cervix	2	
	Ca endometrium	1	
	RCC	10	
	Ca Ub	1	
	Blood and Lymphatics	93	
	CNS	12	
	Respiratory (BCC)	61	
	Endocrine	12	
	Skin	1	
	Muskuloskeletal	1	
AB+ (97)	Ca stomach	5	0.01*

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	Ca breast	8	
	Ca pancreas	2	
	Ca rectum	2	
	Ca colon	5	
	Ca buccal mucosa	3	
	Ca caecum	2	
	Ca prostate	1	
	Ca ovary	6	
	Ca bladder	0	
	Ca cervix	0	
	Ca endometrium	0	
	RCC	2	
	Ca Ub	1	
	Blood and Lymphatics	20	
	CNS	12	
	Respiratory (BCC)	22	
	Endocrine	6	
	Skin	0	
	Muskuloskeletal	0	
O- (40)	Ca stomach	5	0.23
	Ca breast	0	
	Ca pancreas	0	
	Ca rectum	0	
	Ca colon	2	
	Ca buccal mucosa	2	
	Ca caecum	0	
	Ca prostate	4	
	Ca ovary	6	
	Ca bladder	2	
	Ca cervix	0	
	Ca endometrium	0	
	RCC	0	
	Ca Ub	0	
	Blood and Lymphatics	12	
	CNS	2	
	Respiratory (BCC)	2	
	Endocrine	2	
	Skin	1	
	Muskuloskeletal	0	
A- (23)	Ca stomach	1	0.45
	Ca breast	1	
	Ca pancreas	0	
	Ca rectum	0	
	Ca colon	0	
	Ca buccal mucosa	0	
	Ca caecum	0	
	Ca prostate	1	
	Ca ovary	5	
	Ca bladder	0	
	Ca cervix	0	
	Ca endometrium	0	
	RCC	0	
	Ca Ub	0	
	Blood and Lymphatics	15	
	CNS		
	Respiratory (BCC)	0	
	Endocrine	0	
	Skin	0	
	Muskuloskeletal	0	
B- (27)	Ca stomach	2	0.34
	Ca breast	2	
	Ca pancreas	1	
	Ca rectum	2	
	Ca colon	0	
	Ca buccal mucosa	0	
	Ca caecum	0	
	Ca prostate	2	
	Ca ovary	5	
	Ca bladder	0	
	Ca cervix	0	
	Ca endometrium	0	
	RCC	1	
	Ca Ub	0	
	Blood and Lymphatics	12	
	CNS	0	
	Respiratory (BCC)	0	
	Endocrine	0	

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	Skin Muskuloskeletal	0 0	
AB- (03)	Ca stomach Ca breast Ca pancreas Ca rectum Ca colon Ca buccal mucosa Ca caecum Ca prostate Ca ovary Ca bladder Ca cervix Ca endometrium RCC Ca Ub Blood and Lymphatics CNS Respiratory (BCC) Endocrine Skin Muskuloskeletal	0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0	0.89

As per [Table 3] association of ABO blood group with Neoplastic disorders as seen the most common blood group was O+ which was statistically significant with all neoplastic disorders (GIT, CNS, genitor-urinary etc) $p<0.05$. Blood group A+ is significantly associated with Neoplasm of Blood and Lymphatics which suggest that A+ blood group are at higher risk for developing leukemia. Nearly all Neoplasm involving GIT, CNS, Respiratory except skin are significantly associated with B+ blood group. ($p<0.05$). Among O-ve blood group it is only significantly associated with blood and lymphatics.

Table 4: Association of age with ABO and Rh blood grouping

Blood group	**Age group (years)**			**p-value**
ABO and Rh (+)	**0-20**	**20-40**	**>40**	
O+	163	347	53	0.01*
A+	100	151	110	0.01*
B+	97	227	65	0.01*
AB+	34	42	21	0.11
Rh (-)				
O-	12	10	18	0.01*
A-	10	7	6	
B-	8	10	9	0.23
AB-	1	1	1	0.34

As per [Table 4] the most common age group was found to be 20-40 years seen in 47% of patients which was statistically significant with ABO + blood groups followed by 0-20 years which was significant with ABO blood group ($p<0.05$).

DISCUSSION

It was reported that blood Group O was found to be more common in India although studies have reported that group B was more common in Northern India while Group O was more common in Southern India. The relationship between ABO blood group and susceptibility of various diseases has been studied for at least the past 60 years.[4] In a study among voluntary blood donors conducted,[5] at King George's Medical University, Lucknow, UP, India, found that the blood Group B (34.84%) was the most common group prevalent in donors, followed by Group O (29.75%), A (21.50%), and AB (13.91%). Same as a study conducted by K Akhtar et al. at Jawaharlal Nehru Medical College Aligarh, UP, India.[6] Hirszfeld and Hirszfeld,[7] showed the frequencies of blood Groups A and B differ between populations which may be due to the random genetic drift and founder effects or the result of natural selection.

A hospital-based retrospective study was conducted to study the distribution of ABO blood groups in lymphoma, acute myeloid leukemia, and ALL, the results of the study showed that in Hodgkin's lymphoma and ALL there is an increased proportion of B blood group and O blood group, respectively.[8] Similar to above irrespective type of MPD, in this study, there is an increased proportion of blood Group-B followed by blood Group-O.

According to the findings by Polish researchers, carriers of A and AB blood groups had a significantly increased risk of laryngeal carcinoma.[9,10] However, it should be noted that their further investigations did not replicate previous results. An association between the ABO blood group system and colorectal cancer risk has not been confirmed in series of studies performed in different populations and ethnicities.

Although series of case-control studies failed to establish ABO blood groups as a major risk factor for breast cancer reported that familial breast cancer

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cases had a 2-fold higher prevalence of blood group B than did the sporadic cases, and the frequency of this blood group in non-affected relatives of cases was significantly reduced.[11-13] Moreover, another study has demonstrated that the absence of the Rh factor (Rh-) was positively associated with a 50% increased breast cancer risk. Likewise, it has been revealed that the relative risk of metastasis in Rh- patients with breast cancer was 4.2 times higher than that in Rh+ patients interestingly the relative risk of metastasis was 1.29 times higher in subjects who simultaneously possessed Rh+ and A blood group. Although there was suggested that the blood group B may play a role in the development of esophageal carcinoma, several subsequent investigations failed to confirm this hypothesis.[14] Finally, two studies regarding lung cancer did not obtain any significant associations however; another study demonstrated that the frequency of the blood group A was significantly higher in lung cancer patients in comparison with corresponding donors.[15]

There are also several case-control studies investigating ABO and Rh blood groups in relation to gynecological cancer risk. Recently, one group of authors performed a comprehensive study using the data from 49,153 subjects of mixed US population. The authors demonstrated that in comparison with women with blood group O, carriers of blood group AB or B had a non-significant increase in epithelial ovarian cancer incidence (RR=1.38; 95%CI: 0.88-2.16 and RR=1.38, 95%CI: 0.96-1.99, respectively).[16-18]

Direct mechanisms of the impact of ABO blood group system on cancer development are elusive. However, there are several hypotheses which may explain the associations observed. It could be that A and B antigens might somehow help cancers grow more aggressively. It has been shown that the presence of A and B antigens may increase cellular motility and facilitate the interactions between tumor cells.

CONCLUSION

Our findings suggest possible association between the ABO blood groups and an increased risk of cancer especially blood and Lymphatics and GIT, Genitourinary. Further revealing of risk markers in antigens of erythrocytes can be applied in programs of cancer prevention and screening. We hope that our study will stimulate further investigations devoted to this issue.

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