

# Correlation of ABO/Rh Blood Groups with Various Malignancies at a Tertiary Hospital in Kashmir

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## Abstract

**Background:** Association of ABO blood types with many diseases, though still unclear, has been reported since very early times. They are basically glycoprotein conjugates displayed on the surface of red blood cells. A simple test for the presence or absence of antigen A or antigen B in the blood can determine an individual's ABO blood type. ABO/Rh blood groups are determined genetically. ABO and Rh blood group's systems besides being most important in transfusion medicine, play an important role in forensic pathology, disease susceptibility, and population genetics. Over the recent years, their role in association with various malignancies has been intensely studied.

**Aims and Objectives:** This study was aimed to analyze the possibility of the association of blood groups with various malignancies.

**Materials and Methods:** This study was carried out in the Departments of Internal Medicine and Radiation Oncology, Government Medical College, Srinagar, from January 2016 to September 2018.

**Results:** Blood Groups A and B were the most prevalent blood groups overall in all the cancers.

**Key words:** ABO, Cancer, Kashmir, Rh

## INTRODUCTION

The distribution of blood groups varies across various ethnic, geographic, and socioeconomic groups.<sup>[1]</sup> ABO blood group has been seen to be associated with many diseases.<sup>[2]</sup> The earliest reports of the association of ABO blood group with malignancies like gastric cancer have been as early as in the 1950s.<sup>[3]</sup> Subsequent studies have shown significant corroboration of various cancers such as neurologic tumors, salivary gland tumors, kidney, and cervical with a particular blood group<sup>[4]</sup> and that of skin and melanoma with another group<sup>[5]</sup> genetic alteration is proposed at 9 q 34.2 gene in many cancers, which is the locus of ABO blood grouping.<sup>[2]</sup>

## MATERIALS AND METHODS

Data of 1904 patients were analyzed from January 2016 to September 2018, in all histologically documented cancer patients with respect to their blood groups. This was a retrospective, non-randomized cross-sectional study carried out in the Departments of Internal Medicine and Radiation Oncology, Government Medical College, Srinagar. Besides, correlating association of blood groups with particular malignancy, other demographic end points such as association (of particular blood group) with gender, habitation (rural/urban), personal and dietary habits were analyzed.

## RESULTS

Our analysis revealed blood Groups A and B to be the most common groups while gastrointestinal (GI) malignancy was the predominant cancer one which was followed by lung and breast cancers. Gastric cancer constituted 13% of all cancers and blood Group A was seen in 35% of these patients. Thymoma was the least common cancer registered at our center [Table 1].

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**Table 1: Overall distribution of various cancers**

System	n (%)
CUPs	51 (2.67)
Head and neck	84 (4.4)
CNS	24 (1.2)
Esophagus	134 (7.0)
Stomach	253 (13)
Colon	139 (7.3)
Rectum	118 (6.1)
Breast	208 (10.92)
Lung	243 (12.7)
Lymphoma	93 (4.88)
Hepatobiliary	90 (4.72)
Ovarian	81 (4.25)
Cervicouterine	29 (1.29)
Prostate	65 (3.41)
Kidney	32 (1.68)
Urinary bladder	60 (3.15)
Sarcoma	59 (3.09)
Skin and melanoma	58 (3.04)
Multiple myeloma	35 (1.83)
Germ cell tumor	21 (1.10)
Thyroid	20 (1.05)
Thymoma	7 (0.36)
Total	1904 (100)

CNS: Central nervous system, CUPs: Carcinoma unknown primaries

**Table 2: Baseline demographic parameters**

Blood group	A	B	AB	O
Total n (%)	665 (35)	630 (33)	366 (19.5)	243 (12.5)
Mean age	46	64	56	48
Gender				
Male	407	378	150	202
Female	258	252	216	41
Residence				
Rural	466	366	270	190
Urban	199	264	96	53
Tobacco user (%)	66	72	63	77
Vegetarian (%)	22	07	16	08
Non-vegetarian (%)	78	93	84	92

Majority of the patients had blood Groups of “A” and “B,” with around 65% of the patients having these two groups. Mean age of all the patients was in between 45 and 65 years, and male gender was predominant in all blood groups (59.7% vs. 40.3%). Majority of the patients were from rural areas across all blood groups (67.8% vs. 32.2%) and most of them were non-vegetarians with a history of tobacco use in one form or the others.

In head and neck cancers( 4%) & central nervous system tumors (1.2%), blood Group B was the commonest followed by Group A [Table 2] the major blood group was “B” (37.5% and 56.1, respectively), followed by Group A (35% and 31.3%, respectively).

Gastro-intestinal cancers formed nearly one third of all cancers [Table 1], of which blood Group B was

predominant in esophageal and rectal cancers (40% and 34.6%, respectively), while as in colonic cancer, Group A was the most common. Blood Group O formed over 25% of esophageal cancers against a lowest of around 8% in gastric cancers. In lung cancer, which was the second most common cancer (12.7%), nearly 50% of the patients had blood Group A (46%), while as AB blood group was the least common one (10.7%). Likewise in breast cancer which constituted a little over 10% of all patients, blood Group A was seen in over 40% of patients.

In the genitourinary system, blood Group “B” was most common in prostate and urinary bladder (44.7% and 41.7%, respectively) and Group A was most common in renal cell cancer (43.4%).

Over 40% of the patients of hepatobiliary cancers had blood group B [Table 3], Group “B” was predominant with over 40% of patients.

Patients of lymphomyeloproliferative disorders (lymphoma and myeloma) had blood groups “AB” and “A” as the most common blood groups (40.5% and 31.7%, respectively). Blood Group B was the most common in gynecological cancers (42%) [Table 3].

Overall, it was seen that blood Groups A and B were the most common blood groups across all systems, with the observation that for each respective ABO group, Rh positive was more common than Rh negative, with overall prevalence of 68% in Rh-positive versus 32% in Rh-negative group [Figure 1].

## DISCUSSION

The role of ABO blood group in cancer biology has been studied by several investigators following first clinical observations more than six decades ago by Lansteiner, in 1901,<sup>[6]</sup> on the basis of the presence or absence of A and B surface antigens, ABO blood group system is divided into four blood types. The blood groups are A, B, O, and AB. The frequency of four main ABO blood groups is seen to vary throughout the world population.<sup>[7]</sup>

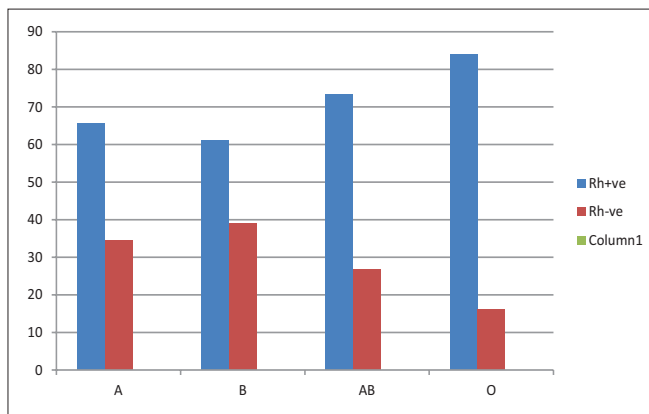
Our observations were in contrast to world statistics where blood Group O is the most common blood group and AB the least common (O>A>B>AB), while as regard to Rh antigen, it was same as that of the rest of the world (Rh +ve> Rh -ve).<sup>[7]</sup>

Data from Northern India have shown overall predominance of blood Groups A and B in donor-based population study,<sup>[8]</sup> whereas in Southern Indian states, blood Group O has been the more common blood group.<sup>[9]</sup> In Kashmir valley, blood

**Table 3: Distribution of blood groups in various cancers**

Type of cancer	Number of patients (% of total malignancies)	A%		B%		AB%		O%	
		+	-	+	-	+	-	+	-
Head and neck	84/1904 (4.4)	22	13	29.5	8	4	3.5	15.5	4.5
CNS	24/1904 (1.2)	22.3	09	28.1	28	2.2	4.1	4.1	2.2
Esophagus	134/1904 (7.0)	13	10.3	30	10	4.5	5.5	25	1.7
Stomach	253/1904 (13)	28.2	05	14	13.5	17.5	13.5	7	1.3
Colon	139/1904 (7.3)	30.3	08	15	7.5	20.2	1	16	2
Rectum	118/1904 (6.1)	10.4	10.4	22.4	12.2	22.6	6	14	2
Breast	208/1904 (10.92)	32.4	10	20.3	10	12.9	3.2	10	1.2
Lung	243/1904 (12.7)	24.3	22.4	16.4	14.4	5.5	5.2	9.8	2
Lymphoma	93/1904 (4.88)	18.5	10	6.1	5.5	32	8.5	17	2.4
Hepatobiliary	90/1904 (4.72)	22.8	14	21.7	20	8.5	3	8	2
Ovary	81/1904 (4.25)	16	14.5	32.5	23.2	7.5	3.5	1.8	1
Cervix/endom.	29/1904 (1.29)	13.6	11	30	12	15.8	3.6	11	3
Prostate	65/1904 (3.41)	9.4	7.6	34.7	10	27	4	6	1.3
Kidney	32/1904 (1.68)	33	10.4	15.5	13.4	11.5	9.5	5	1.7
Urinary bladder	60/1904 (3.15)	22	9	21.7	20	6.6	6.1	12.6	2
Sarcoma	59/1904 (3.09)	50	8.5	16.5	13.3	4	2	4.2	1.5
Skin and melanoma	58/1904 (3.04)	16.1	14	14.8	15.7	30	2.7	5.7	1
Multiple Myeloma	35/1904 (1.83)	20	11.7	21.4	7	14	8.4	16	1.5
Germ cell	21/1904 (1.10)	30	8.7	14.1	18.2	14	2.8	10	2.2
Thyroid	20/1904 (1.05)	16.6	11	25	8.8	20	8.5	8	2.1
Thymoma	07/1904 (0.36)	22	18	11.6	15.4	7	1.9	20	4.1
CUPs	51/1904 (2.67)	18	20.7	33	9.5	10	2.4	5.2	1.2
<b>Total</b>	<b>1904 (100)</b>		<b>35</b>		<b>33</b>		<b>19.5</b>		<b>12.5</b>

CNS: Central nervous system, CUPs: Carcinoma unknown primaries



**Figure 1: Percentage-wise prevalence of various blood ABO and Rh groups in various malignancies (A positive = 65.6%, A negative = 34.4%), (B positive = 61%, B negative = 39%), (AB positive = 73.2%, AB-VE = 26.8%), (O+VE = 84%, O-VE = 16%)**

Group “O” is reported to be the common blood group and “AB” group to be the least common. Rh-positive group, however, is consistently more common than Rh negative.<sup>[10]</sup>

Various analyses have been carried out to corroborate association of various malignancies with the blood groups though with mixed results. Many of these have shown association of particular cancer with a specific ABO group.<sup>[3,5,11]</sup> Our analyses revealed a predominance of blood Group “A” and “B” (35% and 33%, respectively) in nearly

all of our cancer patients, which presumably was due to overall high incidence of these blood groups in all the cancers taken together. Although blood Group “O” was the least common among overall cancers, significant patients of H and N, esophageal, lymphoma, urinary bladder, and thymoma had blood Group “O” [Table 3].

Overall, blood Group A has been found to be more prevalent in GI cancers, which has been postulated to be due expression of a “Forsman antigen” in these patients.<sup>[3,12]</sup>

Among the GI cancers, esophageal cancer has been seen to be more prevalent in patients of A blood group in some of the studies,<sup>[13-15]</sup> whereas contradictory results were found an analysis which showed esophageal cancer to be more in blood Group “B” followed by “A.”<sup>[16]</sup>

Gastric adenocarcinoma has been seen to be associated with blood Group A,<sup>[2]</sup> consistently one-third of gastric cancer patients had blood Group A in our study.

Association of colorectal cancers has not been rigorously studied, but an analysis by Cao *et al.* suggested blood Group AB to be a favorable prognostic indicator compared to non-AB group with regard to mean overall survival.<sup>[17]</sup> Our analysis revealed 38% of colonic cancers to be having blood Group A though no prognostication as regard to survival has

been done. In a multivariate analysis conducted on 104,885 participants, no significant risk of association was seen between colorectal cancer patients and ABO blood types.<sup>[18]</sup>

In H and N cancers, we found 37.5% of patients with blood Group B and 35% of patients with Group A. In a South Indian study, patients with blood Group A had nearly 1.5 times more probability of developing oral cancers.<sup>[19]</sup> In contrast analyses from four North Indian hospitals revealed blood Group O to be most prevalent followed by B, A, and AB.<sup>[20]</sup>

In lung cancer which constituted nearly 13% of total cancers, blood A seen in around 46% of the patients and was the most common group followed by blood Group B. In a West Asian study, a protective role was seen in blood Group “O” and “Rh-negative” patients, with regard to lung cancer. Prevalence with rest of AB, A, and B blood groups was not significant.<sup>[21]</sup> While as a similar study<sup>(22)</sup> revealed no statistically significant association of any blood group with lung cancer.<sup>[22]</sup>

A meta-analysis of nearly 10,000 breast cancer patients suggested that blood Group A was risk factor in Caucasians as compared to other groups,<sup>[23]</sup> which was replicated by another study which found blood Group A to be a poor prognosticator in breast cancer patients.<sup>[24]</sup>

However, some recent analyses have failed to demonstrate a significant association and prognostication with ABO groups with breast cancer.<sup>[25]</sup> In our analysis, in breast cancer, blood groups A and B were the commonest (42% & 30 % respectively).

In our analysis, genitourinary and gynecological cancer formed nearly 14% of the cancers with blood Group B predominant in 55% of ovarian cancer patients. Retrospective analyses done on these patients have revealed mixed results, with some studies favoring<sup>[26]</sup> while as other negating any association between ABO blood groups and genitourinary cancers.<sup>[27]</sup>

In an analysis carried out by “Ovarian Cancer Association Consortium,” an amalgam of eight studies - a marginally increased risk of A group was seen as compared to blood Group O in association with ovarian cancers as consistent with our data.<sup>[28]</sup>

Our analysis of CNS tumors revealed a striking predominance of blood Group B, consistent with a North Indian analysis where majority of brain tumor patients had blood Group B.<sup>[2]</sup> There have been conflicting reports from surveys regarding the distribution of ABO blood groups and primary intracranial neoplasms, wherein a study on

ABO blood group frequency and brain tumors found no significant differences between types of intracranial tumors and frequencies of four major blood groups.<sup>[29]</sup>

As far as, hepatobiliary system is concerned, mixed results have been reported from various studies with some studies reporting a lower incidence of pancreatic cancer in blood Group O patients<sup>[30-32]</sup> while as a multivariate analysis revealed no significant prognostication of ABO blood group on pancreatic cancer<sup>[33]</sup> in another Chinese trial of over 14 patients, it was concluded that survival of pancreatic cancer patients with blood Group O was better than non-O blood groups.<sup>[34]</sup>

## CONCLUSION

Our analysis revealed overall predominance of blood Groups A and B in majority of the cancer patients, although a valley-based analysis has shown blood Group “O” to be the most common group and “AB” to be the least common group in a hospital-based analysis done on random blood donors.<sup>[10]</sup> Whether A and B blood groups predispose patients to various cancers, or blood Group O confers protection against the same needs to be worked out.

From analyzing the association of various cancers with these blood groups, it is inferred that an inherited element might be implicated, which either protects or predisposes to the development of cancer. This genetic element coupled with environmental and racial factors need to be explored which might offer some insights into the better understanding of this association.

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