Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 3s, https://carcinogenesis.com/

Association Between Abo Blood Group And The Risk Of Colo Rectal Cancer – An Institutional Study

Dr. Subhasish Das M.D, Ph.D.[1], Queen Marry MD[2], Dr. Nikhil MD[3], Dr. Kalyani MD PhD[4]

[1]Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India, E-mail-daspathology@gmail.com

[2]Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

[3]Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

[4]Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

Corresponding Author: Dr. Subhasish Das M.D, Ph.D.

E-mail- daspathology@gmail.com

ABSTRACT

Introduction - Colorectal cancer is the second most frequent cancer in women and the third most common cancer in males. The incidence of colorectal cancer is rapidly rising in developing countries like India. The blood group system serves as a distinguishing marker of identification, providing an essential component of an individual's personality and distinctiveness. the aim of the present study is to assess the the distribution of the ABO blood group system (A, B, O or AB) and Rhesus type (Rh-positive or Rh-negative Rh+ or Rh-) in subjects with colorectal cancer.

Methodology - The present study is a retrospective record based study on subjects with colorectal carcinoma at Sri Devaraj URS Academy of Higher Education & Research, Kolar in Karnataka which was conducted over a period of 5 years study (2017 – 2022). The clinical data were obtained from subject's files who met the above mentioned inclusion criteria and also subjects who agreed to participate in the study, using the pre-structured questionnaire to minimize data errors.

Results - Out of 67 subjects, 34.3% belongs to A group, whereas 7.5% belongs to AB group, 17.9% belongs to B group and 40.3% belongs to O group.80.6% of the study subjects were found to be RH positive whereas 19.4% of the study subjects were RH negative.

Conclusion - Our study found no link between ABO and Rh blood groups and colorectal cancer. While our findings contradict those populations that show a positive association, it is crucial to recognise that different factors can influence different elements of colorectal cancer.

Keywords: *Cancer, Blood grouping, Sigmoidoscopy, Rh factor.*

How to Cite: Dr. Subhasish Das M.D, Ph.D., Queen Marry MD, Dr. Nikhil MD, Dr. Kalyani MD PhD, (2025) Association Between Abo Blood Group And The Risk Of Colo Rectal Cancer – An Institutional Study, *Journal of Carcinogenesis, Vol.24, No.3s,* 142-149.

1. INTRODUCTION

Solid tumours especially the malignant ones are the major public health threat across the world, which pose a major health hazard to human health and leading to a increased mortality rate. Cancer identification, and treatment are areas of intense study attention in order to find risk factors such as biological biomarkers and demographic factors. Such factors can provide valuable insights into risk rates, prognosis, treatment responses, and overall cancer outcomes, aiding in clinical decision-making [1].

Colorectal cancer is the second most frequent cancer in women and the third most common cancer in males. Colorectal cancer is one of the silent cancer and it is the third most common cause of death and the fourth commonly diagnosed cancer in the world [1,2].

While curative surgery allows for long-term survival, rectal cancer has the potential to spread to thoracic organs, bones,

and the neurological system2. Although hereditary malignancies are uncommon, certain inherited features, such as blood group systems, may be linked to cancer risk [2,3].

The incidence of colorectal cancer is rapidly rising in developing countries like India. Both environment factors and hereditary factors plays a major role in etiology of this disease [4,5].

The most commonly related factors for colorectal cancers, are age, gender, geographical location, obesity, diet, and hereditary. Even though the environmental and hereditary factors have a limited scope on disease progression, and meanwhile the main etiological factor is still unknown [6,7].

The blood group system serves as a distinguishing marker of identification, providing an essential component of an individual's personality and distinctiveness [8].

The ABO gene encodes glycosyltransferases, which are responsible for transferring nucleotide donor sugars to the H antigen, resulting in ABO blood group antigens. These antigens are found on the surface of red blood cells as well as a variety of other tissue types, including those in the gastrointestinal system [9].

ABO blood grouping system was initially identified in 1900. Blood groups are divided based on the presence or absence of A and B antigens on erythrocytes, nowadays it's being statistically linked to many diseases. In the past decades many researches were conducted to observe the linkage of ABO grouping system on various diseases, especially cancers, but there is no statistically convincing results [9, 10].

The association of blood grouping in developing cancers was first identified in an arid study in the year 1953.
Numerous studies have been conducted to investigate the association between various blood groups and the risk, prognosis, and results of various cancers, including breast cancer, thyroid cancer, ovarian and vulvar cancer, skin cancer, cervix carcinoma, and gastrointestinal malignancies [10,11].

In the recent studies, researchers have stated that a blood group is more correlated to gastric cancer. In the current situation the correlation of the A blood group on developing cancers like gastric, uterus, neurological malignancies, kidney has been documented, whereas B blood groups in the oesophagus, and O blood groups in melanoma cancers is also identified in various researches [12] – [14]

Some previous research have found a link between blood group systems and colorectal cancer risk, whereas others have found no meaningful relationships. Furthermore, studies reporting relationships have identified certain blood classes as being associated with the risk of colorectal cancer [15].

But there have been numerous discrepancies observed with lot of inconsistencies in their findings. Hence the aim of the present study is to assess the the distribution of the ABO blood group system (A, B, O or AB) and Rhesus type (Rh-positive or Rh-negative Rh+ or Rh-) in subjects with colorectal cancer.

2. METHODOLOGY

The present study is a retrospective record based study on subjects with colorectal carcinoma at Sri Devaraj URS Academy of Higher Education & Research, Kolar in Karnataka which was conducted over a period of 5 years study (2017 – 2022). The subject related data were collected from the archives of Department of Pathology.

The main aim of the present study is to study the distribution of the ABO blood group system (A, B, O or AB) and Rhesus type (Rh-positive or Rh-negative Rh+ or Rh-) in subjects with colorectal cancer.

Subjects older than 15 years, Subjects with a positive biopsy result for colorectal adeno-carcinoma were included in the study, whereas subjects lesser than 15 years and subjects with missing clinical data, subjects with benign colorectal diseases, synchronous another primary cancer, and non-adeno carcinoma were excluded.

The clinical data were obtained from subject's files who met the above mentioned inclusion criteria and also subjects who agreed to participate in the study, using the pre-structured questionnaire to minimize data errors. The obtained data includes subject's demographic details like age, gender, Body mass index (BMI)), Comorbidities like hypertension and diabetes mellitus, familial history of cancer and inflammatory bowel disease, blood group, location of the cancer, grade and differentiation of cancer, physical and dietary habits of subjects.

The present study was approved by the Institutional Review Board of the Ethics Committee of Sri Devaraj URS Academy

of Higher Education & Research, Kolar, Karnataka, India and the study was conducted according to compliance with the ethical standards of the responsible institution on human subjects as well as with the Helsinki Declaration.

The study subjects were divided into four different groups accordingly to their blood group type (A, B, AB, or O). The subjects were also asked about their blood type and Rh factor (positive or negative). In the present study we used BMI (weight in kilograms/ (height in meters) to measure total adiposity. In addition, subjects were also asked about their smoking status and alcohol consumption history, history of inflammatory bowel disease, or family history of cancer. Study subjects were also asked about their intensity of physical activity and dietary habits. Clinico-pathological factors such as histo-pathological grade of cancer, anatomical location of cancer, metastatic status, and mode of diagnosis for cancer diagnosis (colonoscopy, computed tomography (CT), guaiac-based faecal occult blood test (gFOBT), or sigmoidoscopy) were also obtained.

The sample size for the present study is calculated using te formula $N=\underline{Z\ (1-\alpha)^2(p)(q)}/D^2$. Sample size for present study is estimated based on 56% positivity for colorectal carcinoma in subjects with evenly spaced blood groups A and O as reported in study, considering an absolute error of 10% with 90% confidence interval, the estimated final sample size for the study is 68.

3. STATISTICAL ANALYSIS

Descriptive statistics were prepared using Microsoft excel 2007 version. The data obtained was coded and fed into the SPSS (Statistical Package for Social Sciences) version 17 for analysis. Categorical data were presented as number and percentages by using contingency tables and continuous data as mean and standard deviation. Data was analysed using Chi-square test. One way analysis of variance was used to compare the efficacy of xylitol based oral hygiene products between each groups. All statistical tests were performed at 95% confidence interval. A p value less than 0.05 was considered as statistically significant.

4. RESULTS

The present study comprises of 67 subjects out of which 29 were females and 38 were males. On comparing the gender distribution with blood group, it was found to be statistically significant (0.032).

The age wise distribution of study subjects with blood group was not found to be statistically significant (0.954). 31.3% of subjects were less than 50 years, 14.9% falls in the category of 50 – 59 years, 35.8% falls in the category of 60 – 69 years and 17.9% were above 70 years.

82.1% of study subjects were found to be obese and above 75 kilograms which was found to be statistically not significant (0.409). 85.1% of the study subjects were of mixed diet and 14.9% study subjects were found to be vegetarians which was found to be statistically not significant (0.593).

Out of 67 subjects, 34.3% belongs to A group, whereas 7.5% belongs to AB group, 17.9% belongs to B group and 40.3% belongs to O group.80.6% of the study subjects were found to be RH positive whereas 19.4% of the study subjects were RH negative.

On evaluating the past medical history of study subjects, 17.9% were found to be hypertensive, 16.4% were found to be diabetic, 13.4% were found to have inflammatory bowel disease and 9% of the subjects has a familial history of cancer that runs in their family. Apart from the medical history 13.4% subjects underwent colonoscopy and sigmoidoscopy.

Based on the surgical resection of study subjects, 13.4% of the specimen was from anterior resection, 22.4% of the study specimen was from abdominal perineal resection and 64.2% of the study specimen was from hemicolectomy.

On evaluating the location of the tumor, 19.4% were from ascending colon, 7.5% were from descending colon, 1.5% from rectosigmoidal region, 22.4% from sigmoidal colon and 6.6% from transverse colon. Majority of the study subjects had tumour located on rectum which comprised of 43.3% which was not found to be statistically significant (0.468)

Based on the grading of the tumour, 34.3% of the tumours were well differentiated, 49.3% were of moderately differentiated and 16.4% were of poorly differentiated, which was not found to be statistically significant (0.868)

6% of the tumour were of proliferative type, 38.8% of the tumour were of ulcerative type and 55.2% of the tumour were of ulcero-proliferative type.28.4% tumours were of stage I, 37.3% of the tumours were stage II and 34.3% of the tumours were stage III which was not found to be statistically significant (0.098)

On comparing the size of the tumour 64.2% of the tumour were less than 50 mm, whereas 35.8% were above 55 mm which was not found to be statistically significant (0.245)

On evaluation of the lymph node involvement, 34.3% showed a positive lymph node involvement whereas 65.7% showed negative lymph node involvement which was found to be statistically significant (0.048)

Only 4.5% of the study subjects showed a positive lymphovascular invasion which was found to be highly statistically significant (0.001) and 3% showed positive perineural involvement which was found to be not statistically significant (0.096).

TABLE 1 – DEMOGRAPHIC DETAILS

DEMOGRAPHICS	N	%
Gender		
Female	29	43.3%
Male	38	56.7%
Age		
<50yrs	21	31.3%
50-59yrs	10	14.9%
60-69yrs	24	35.8%
≥70yrs	12	17.9%
Obesity		
<75kg	55	82.1%
>75kg	12	17.9%
Diet		
Non vegetarian	57	85.1%
Vegetarian	10	14.9%
Blood group		
A	23	34.3%
AB	5	7.5%
B	12	17.9%
O	27	40.3%
Comorbidities		
Hypertension	12	17.9%
Diabetes	11	16.4%
IBD	9	13.4%
Colonoscopy	9	13.4%
FOBT	9	13.4%
Sigmoidoscopy	7	10.4%
Family H/o cancer	6	9.0%

TABLE 2 – CHARACTERISTICS OF THE CANCER IN STUDY SUBJECTS

CANCER CHARACTERISTICS		N	%
Specimen type	Anterior resection	9	13.4%
	APR	15	22.4%
	Hemicolectomy	43	64.2%
Site	Ascending colon	13	19.4%
	Descendingcolon	5	7.5%
	Rectosigmoid	1	1.5%
	Rectum	29	43.3%
	Sigmoid colon	15	22.4%
	Transverse colon	4	6.0%
Malignancy grading	Moderately differentiated	33	49.3%

Growth	Poorly differentiated	11	16.4%
	Well differentiated	23	34.3%
	Proliferative	4	6.0%
	Ulcerative/infiltrative	26	38.8%
	Ulceroproliferative	37	55.2%
Staging	I	19	28.4%
	II	25	37.3%
	III	23	34.3%
Tumor size	>50MM	24	35.8%
	<50MM	43	64.2%
LN positive	Absent	44	65.7%
	Present	23	34.3%
LVI	Absent	64	95.5%
	Present	3	4.5%
PNI	Absent	65	97.0%
	Present	2	3.0%
Blood group	A	23	34.3%
	AB	5	7.5%
	B	12	17.9%
	O	27	40.3%
RH positivity	Negative	13	19.4%
	Positive	54	80.6%

TABLE 3 – CHARACTERISTICS OF CANCER WITH BLOOD GROUPING

PARAMATERS	**A**	**AB**	**B**	**O**	**p value**
	%	**%**	**%**	**%**	
GENDER					
Female	34.5%	6.9%	3.4%	55.2%	0.032
Male	34.2%	7.9%	28.9%	28.9%	
AGE					
<50yrs	33.3%	9.5%	19.0%	38.1%	0.954
50-59yrs	20.0%	10.0%	20.0%	50.0%	
60-69yrs	33.3%	4.2%	16.7%	45.8%	
≥70yrs	50.0%	8.3%	16.7%	25.0%	
OBESITY					
<75kg	30.9%	9.1%	20.0%	40.0%	0.409
>75kg	50.0%	.0%	8.3%	41.7%	
DIET					
Non veg	35.1%	8.8%	15.8%	40.4%	0.593
Veg	30.0%	.0%	30.0%	40.0%	
RH FACTOR					
Negative	46.2%	7.7%	15.4%	30.8%	
Positive	31.5%	7.4%	18.5%	42.6%	
COMORBDITIES					

Smoking	34.4%	9.4%	25.0%	31.3%	0.353
Drinking	34.3%	8.6%	28.6%	28.6%	0.064
Hypertension	25.0%	8.3%	25.0%	41.7%	0.849
Diabetes	9.1%	18.2%	18.2%	54.5%	0.162
IBD	55.6%	22.2%	.0%	22.2%	0.069
Colonoscopy	55.6%	22.2%	.0%	22.2%	0.069
FOBT	55.6%	22.2%	.0%	22.2%	0.069
Sigmoidoscopy	71.4%	14.3%	.0%	14.3%	0.096
Family History of cancer	33.3%	16.7%	.0%	50.0%	0.555

PARAMATERS	**A**	**AB**	**B**	**O**	**p valve**
	%	**%**	**%**	%	
LOCATION					
Colon	29.7%	5.4%	16.2%	48.6%	0.468
Rectum	40.0%	10.0%	20.0%	30.0%	
GRADING					
Moderately differentiated	27.3%	15.2%	27.3%	30.3%	
Poorly differentiated	36.4%	.0%	9.1%	54.5%	0.086
Well differentiated	43.5%	.0%	8.7%	47.8%	
GROWTH					
Proliferative	25.0%	.0%	.0%	75.0%	
Ulcerative/infiltrative	30.8%	19.2%	15.4%	34.6%	0.098
Ulceroproliferative	37.8%	.0%	21.6%	40.5%	
STAGING					
I	52.6%	.0%	15.8%	31.6%	
II	40.0%	8.0%	12.0%	40.0%	0.143
III	13.0%	13.0%	26.1%	47.8%	
TUMOR SIZE					
>50MM	20.8%	12.5%	16.7%	50.0%	0.245
<50MM	41.9%	4.7%	18.6%	34.9%	
LN POSITIVE					
Absent	45.5%	4.5%	13.6%	36.4%	0.048
Present	13.0%	13.0%	26.1%	47.8%	
LVI					
Absent	34.4%	4.7%	18.8%	42.2%	0.001
Present	33.3%	66.7%	.0%	.0%	
PNI					
Absent	33.8%	6.2%	18.5%	41.5%	0.096
Present	50.0%	50.0%	.0%	.0%	

5. DISCUSSION

The aim of the present study is to correlate the relationship between ABO blood group system and RH factor and the risk of colorectal cancer. The findings of the present study states that O blood group has the highest frequency followed by A group and B group, and AB group has the lowest propotion among colorectal cancer subjects. The findings are in accordance with ***Hosein Jodat et al*** (2022) in Iran wherein they have published a similar results [16].

The findings are also in accordance with ***Cao et al***, ***Hsiao et al***, and ***Kerimov et al*** where in they stated that highest

association is observed in O group, followed by A and B group. The results are in contrast with ***Kahramanaca S et al,*** wherein e stated that the highest frequency related to the A blood group, followed by B, O, and AB in colorectal cancer patient and ***Urun et al*** wherein they stated that the highest frequency related to the A group followed by O, B, and AB, respectively. These disparities may be related to variances in the size of the research sample as well as differences in the frequency of ABO blood groups varies by geographical area [1,10,17,18,19]

We admit that the distribution of ABO and Rh blood groups was similar in colorectal cancer patients and the healthy community. Our study suggest that their findings do not show a significant link between ABO and Rh blood groups and colorectal cancer risk, which is consistent with the findings of other studies which was in accordance with ***Khalili H et al*** [20].

The result of the present study is contrast with ***Kashfi et al*** wherein they establishes a relationship between the ABO blood group and colon cancer and ***Ling-Tzu Hsiao et al*** wherein they stated that the presence of certain antigens might play a role in colon cancer development [2,10].

The results are also in contrast with ***Cao et al***, where they found that non-AB blood types may be associated with increased survival in colon cancer patients. Our findings are consistent with another study by ***Kashfi SM et al*** that revealed no link between the Rh blood group and colon cancer. However, a recent study suggests a link between Rh and colon cancer [1,2]. Our findings show that the ABO blood group has no relationship with clinicopathological aspects of colorectal cancer, such as cancer kind or tumour type. In this sense, our findings are consistent with previous research conducted by ***Cao X et al, Wei J et al*** and ***Kahramance et al,*** wherein they found that there is no significant link between ABO and Rh blood groups and cancer stage or tumour pathology findings [1,10,21].

6. CONCLUSION

As mentioned above, our study found no link between ABO and Rh blood groups and colorectal cancer. While our findings contradict those populations that show a positive association, it is crucial to recognise that different factors can influence different elements of colorectal cancer. More thorough investigations with bigger populations are required to explain this link and its underlying mechanisms.

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