Khalij Libya Journal of Dental and Medical Research. 2025;9(1):124-129
https://doi.org/10.47705/kjdmr.25911019
eISSN:2708-888X

Original article

Association Between ABO Blood Groups and Cancer Susceptibility in the Libyan Population

Salah Elbaruni*, Nidal Bilkhier, Gomaa Sulaiman

Department of Medical Laboratory, Faculty of Medical Technology, University of Tripoli, Tripoli, Libya.
Corresponding Email: *Selbaruni@gmail.com*

Abstract
While earlier studies have demonstrated the impact of blood groups on numerous diseases, such as cardiovascular disease and infections, researchers have also revealed intriguing links between certain blood groups and the risk of certain cancers. Evidence suggests that individuals with blood type O have a slight decrease in risk for certain digestive cancers. Whereas individuals who carry blood types A, B, and AB seem to have greater susceptibility to various types, including pancreatic, lung, breast, colorectal, and cervical cancers. However, the exact causes remain unclear, there is growing speculation that some genetic factors within the ABO region may affect the processes of angiogenesis and immune system responses. Bridging these gaps stands to transform strategy for personalized cancer therapies. The purpose of this study, therefore, is to determine the relationship between ABO blood group types and the prevalence of cancer. In analyzing these relationships, the study aims to advance efforts toward more targeted strategies for the prevention and treatment of cancer. We harvested information from the cancer registry of a university hospital affiliated with a tumor registry on 300 Libyan patients aged between 25-85 years, categorized them into eight different types of cancers. Our data collection was through three processes: first, analysing the blood of the cancer patients, second, reviewing the medical files of the patients, and last, distributing public questionnaires. This study has represented differences in the types of cancer that patients may have based on their blood type. Due to the multifaceted approach to data collection, the insights provided from the study can significantly improve the impact of treatment interventions for the advancement of cancer research. During the study, the most prevalent blood group was O+, followed closely by A+. O+ blood type predominated in patients suffering from colon and pancreatic malignancies, while A+ was more frequent in those with lung and prostatic cancers. Fewer cancer patients were found to have an AB blood group. Other relationships regarding blood types and malignancy will be analysed statistically and graphically. Interpreting and understanding blood groups may facilitate the development of personalized healthcare strategies, particularly for high-risk individuals, allowing for targeted interventions to improve overall well-being. Further research, including functional studies, genetic studies and immunological mechanisms, remains necessary to elucidate the impact of ABO antigens on tumor development and prevention.
Keywords. *Cancer, ABO Blood group, Blood types, Angiogenesis, Blood Type Distribution.*

Received: *22/03/25*
Accepted: *25/05/25*
Published: *03/06/25*

Introduction

Blood groups play a decisive role not only in ensuring safe blood transfusion, but also in the effects on various health risks. Since the early 1950s, numerous studies have linked blood group and, subsequently, the Rhesus factor to cancer [1,2]. Several studies showed a reduction in the expression or loss of group antigens on cervical carcinoma cells compared to normal cervical cells [3]. A decrease in the expression of antigens A and/or B, up to complete loss in adenocarcinoma cells [4-5], as well as a loss of ABO system antigens by bladder tumor cells [6]. Several studies have attempted to provide possible explanations for the relationship between blood group and cancer, which currently remain largely unknown. In 2000, G. Garratty notes that cells, when becoming malignant, tend to lose normal antigens and acquire so-called tumour antigens [7]. Some authors have studied the expression of erythrocyte antigens in haematological diseases, considering the issue of changes in the expression of group antigens, and emphasised that loss or decrease in the expression of erythrocyte antigens occurs in several malignant neoplasms of both the blood system and solid organs [8].

The clinical importance of ABO antibodies stems from two things; their occurrence is natural and universal, and they exhibit widespread presence with robust reactions. Studies have shown correlations between ABO blood types and various cancers. For example, blood type A is the most prevalent, while blood type O is less common [9]. Individuals with blood types other than O are reported to have an elevated likelihood of developing prostate cancer, and certain blood types have been associated with increased risks of lung and breast cancers [10]. Notably, those with blood type O demonstrate a lower risk of succumbing to breast cancer compared to individuals with blood types A, B, and AB. Additionally, research has indicated an elevated occurrence of pancreatic cancer among individuals with blood type B, and to a lesser extent, O [11]. Remarkably, individuals with blood group O are identified as the most resistant to cancer, as suggested by a comprehensive study spanning nearly half a century conducted by scientists from the Swedish Karolinska Institute. While the precise biological mechanisms remain unknown, several authors suggested that these associations may be attributed to Single Nucleotide Polymorphism (SNP) variations at the ABO locus linked to serum levels of angiogenesis-promoting molecules such as von Willebrand factor (vWF) and tumor

Khalij Libya Journal of Dental and Medical Research. 2025;9(1):124-129
https://doi.org/10.47705/kjdmr.25911019
eISSN:2708-888X

necrosis factor-alpha (TNF-a) [12,13]. The O/O genotype, characterized by a protective glycosyltransferase function, is believed to exert a safeguarding effect against cancers [14]. one of the explanations is the participation of the ABO blood groups in the regulation of the level of circulation of some proinflammatory and adhesion molecules that play a key role in the process of tumorigenesis [15].
Cells, when becoming malignant, tend to lose normal antigens and acquire so-called tumor antigens [16]. These antigens may be "new" antigens, which are sometimes precursors of normally present antigens, or "illegitimate" antigens, i.e. antigens that should not be present on a genetic basis. In particular, some tumor antigens appear to be true A antigens, appearing in individuals who do not belong to group A; others have properties very close to the A antigen ("A-like"), or may cross-react with anti-A antibodies (e.g., the Tn antigen). There is an assumption that if the immune surveillance theory is correct and the immune system recognizes tumor antigens as foreign, then the “A-like” properties of tumor antigens may lead to the fact that the body of patients with group A does not recognize the tumor antigen as foreign [16].
The objective of this study is to explore the association between different blood type groups and various occurrences of cancer, utilizing data sourced from the hospital’s tumor registry.

Methods

Data collection on blood type distribution among cancer patients was conducted at the Oncology Department of the University Hospital from February 26th to April 3rd, 2024. Three distinct methods were utilised to gather the data: 1). Direct examination of blood samples from cancer patients: A total of 65 blood samples were directly collected from cancer patients for analysis. 2). Review of patient records in the Oncology Department: Patient records from the Oncology Department underwent a thorough review, with 145 records analysed to assess blood type distribution. 3). Distribution of a questionnaire to the public: A total of 90 questionnaires were distributed to the public to gather information on Blood type distribution among individuals. These methods showed variations in blood type distribution among cancer patients with several types of cancer.
It is worth noting that several different methods were employed to ensure data accuracy, involving extensive analysis of numerous samples, records, and questionnaires. The results revealed a wide range of differences, providing valuable insights that could aid in the development of new cancer treatments. Blood Collection and Testing: Upon obtaining consent from volunteers, with the assistance and supervision of hospital nurses and staff, 2 ml of venous blood was aseptically drawn from each volunteer into a serum tube (green-top tube containing EDTA) for blood type testing using the slide method. Data Analysis: Statistical analysis was performed using Excel version 2404. The types of cancer, age, and gender were compared to determine whether there was a statistically significant difference between the groups.

Results

A total of 300 cancer patients were targeted in This study: 75(25%) of the patients were breast cancer patient, 53 patients (18%) with lung cancer, 50 patients (17%) with Leukaemia, 45 patients (15%) with colon cancer, 32 patients (10%) with prostate cancer, 18 patients (6%) with stomach cancer, 15 patients (5%) with bladder cancer, and 12 patients (4%) with pancreatic cancer (Table 1).

Table 1. Distribution of common cancer types in the study population (N=300)

Type of Cancer	Frequency (N)	Percentage %
Breast Cancer	75	25
Lung Cancer	53	18
Leukemic Cancer	50	17
Colon Cancer	45	15
Prostatic Cancer	32	10
Gastric Cancer	18	6
Bladder Cancer	15	5
Pancreatic Cancer	12	4

Among these 300 cancer patients, 160 (53%) were male, and 140 (47%) were female (Figure 1), with ages ranging from 25 to 85 years old. The majority of cancer cases, 223 (75%), were aged between 46 and 75 years (Table 2).

Khalij Libya Journal of Dental and Medical Research. 2025;9(1):124-129
https://doi.org/10.47705/kjdmr.25911019
eISSN:2708-888X

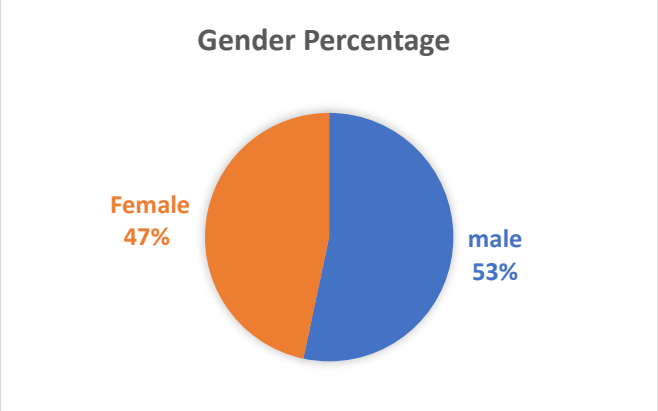

Figure 1. Patient's gender

Table 2. The age distribution of cancer patients in the study sample (N=300)

Age (Year)	Frequency (N)	Percentage %
25-35	22	7
36-45	25	8
46-55	68	23
56-65	95	32
66-75	60	20
76-85	30	10
Total	300	100

ABO blood grouping was performed for all the 300 cancer patients. The most prevalent blood group was Positive blood types (O^+, A^+, B^+ and AB^+), which accounted 282 (94%) cancer cases, while only 18 cancer patients (4%) had Negative blood types (O^-, A^-, B^- and AB^-) (Table 3). This data showed that the population with positive blood types are more frequently associated with cancer and more susceptible to developing cancer diseases than the population with negative blood types.

Out of 282 cancers patient's whit positive blood types, blood group O^+ had 130 (43.3%) cancer patients, followed by A^+ blood group had 110 (36.7%) cancer patients, blood group B^+ had 30 (10%) cancer patients, and blood group AB^+ had 12 (4%) cancer patients. The distribution of the 18 cancer patients with -negative blood types, blood group O^- had 9 cancer patients (3%), blood group A^- had 8 cancer patients (2.7%), and blood group B^- had only 1 cancer patient (0.3%), while no cancer patient had the AB^- blood group (0%) (Table 3). This data showed that the population with blood group O^+ (43.3%) and A^+ (36.7%) are more susceptible to developing cancer diseases and have the highest risk incidence rates of cancer, followed by blood group B^+ (10%).

Table 3. Distribution of ABO blood groups in the study sample (N=300)

Blood type	Frequency (N)	Percentage %	Groups (N&%)
O^+	130	43.3	Positive groups 282 cases 94%
A^+	110	36.7	
B^+	30	10	
AB^+	12	4	
O^-	9	3	Negative groups 18 cases 6%
A^-	8	2.7	
B^-	1	0.3	
AB^-	0	0	

Out of 130 (43.3%) cancer patients with the O^+ blood group, 26 (20%) patients had breast cancer, 23(18%) patients had lung cancer, 20(15%) patients had blood cancer, 29(22%) patients had colon cancer, 7 patients (5%) had prostatic cancer, 11 (8%) patients had stomach cancer, 8(6%) patients had bladder cancer and 6 (5%) patients had pancreatic cancer. The results indicate that colon cancer, 22%, and breast cancer, 20%, are more frequently associated with the O^+ blood group, followed by lung cancer, 18% (Table 4).

Out of 110 (36.7%) cancer patients with the A^+ blood group, 26 (24%) patients had breast cancer, 26 (24%) patients had lung cancer, 19 (17%) patients had blood cancer, 8 (7%) patients had colon cancer, 22 (20%)

Khalij Libya Journal of Dental and Medical Research. 2025;9(1):124-129
https://doi.org/10.47705/kjdmr.25911019
eISSN:2708-888X

patients had prostatic cancer, 6 (5%) patients had stomach cancer, only one patient (1%) had bladder cancer and 2 (2%) patients had pancreatic cancer. The results indicate that breast cancer 24%, lung cancer 24% and colon cancer 20% are more frequently associated with the A^+ blood group (Table 4).

Out of 30 cancer patients with the B^+ blood group (10%), 16 patients (53%) had breast cancer, only one patient (3%) had lung cancer, 5 patients (17%) had blood cancer, 2 patients (7%) had colon cancer, only one patient (3%) had prostatic cancer, no patient (0%) had stomach cancer, 3 patients (10%) had bladder cancer and 2 patients (7%) had pancreatic cancer. The results indicate that breast cancer 53% and blood cancer 17% are more frequently associated with the B+ blood group, followed by bladder cancer 10% (Table 4).

Out of 12 cancer patients with the AB^+ blood group (4%), only one patient (8%) had breast cancer, 2 patients (17%) had lung cancer, no patient (0%) had blood cancer, 5 patients (42%) had colon cancer, only one patient (8%) had prostatic cancer, also one patient (8%) had stomach cancer, 2 patients (17%) had bladder cancer and no patient (0%) had pancreatic cancer. The results indicate that colon cancer 42%, lung cancer 17%, and bladder cancer 17% are more frequently associated with the AB^+ blood group (Table 4).

The p-value for the association between blood type and specific cancer types is 8.53×10^{-25} (0.000000). This indicates a highly significant relationship between blood type and the distribution of cancer types. This suggests that blood type and cancer type are not independent, and suggests a strong association between blood type and the type of cancer a patient develops.

Table 4. Distribution of cancer types among patients with positive ABO blood group

Type of Cancer	O^+ (N= 130)	A^+ (N=110)	B^+ (N=30)	AB^+ (N=12)
Breast Cancer	20%	24%	53%	8%
Lung Cancer	18%	24%	3%	17%
Blood Cancer	15%	17%	17%	0%
Colon Cancer	22%	7%	7%	42%
Prostatic Cancer	5%	20%	3%	8%
Stomach Cancer	8%	5%	0%	8%
Bladder Cancer	6%	1%	10%	17%
Pancreatic Cancer	5%	2%	7%	0%

Discussion

Although several studies have found evidence of an association between ABO blood group antigens and various types of cancers. So far, there is limited understanding of prognostic value in cancer patients [17,18]. This study revealed a correlation between blood groups and eight different types of cancer. The findings indicated that cancer patients with a positive blood group are the most susceptible to developing cancer. The study demonstrates that cancer patients with a positive blood group, particularly blood group O^+, are the most susceptible to cancer, followed by blood group A^+. In contrast, Rose Ewald and Susan reported that cancer is more common in blood group A compared to blood group O [19,20]. This is since some people who carry a non-A blood group have tumors that contain real A antigens or "A-like" antigens that have very similar characteristics to A antigens. In these people, tumor antigens will be considered foreign and will react with A antibodies, leading to an attack on the tumor [19,20]. It is important to note that although ABO genotypes are considerably associated with the risk of certain cancers, they do not cause cancer, they only indicate susceptibility [21].

Breast cancer constitutes 12% of all new cancer cases worldwide [22]. No correlation was found between the ABO blood group and the risk of breast cancer in patient cohorts from England or America [23,24]. However, two consecutive analyses in a study by Su-Yu Miao, Wenbin Zhou, and others indicate that blood group A+ is associated with an increased risk of breast cancer [25,26]. Moreover, this study showed a comparable distribution of blood groups O^+, A^+ and B^+, at (20%) (24%) and (53%) respectively, in people diagnosed with breast cancer.

Lung cancer holds the distinction of being the most prevalent cancer globally, accounting for 13% of all new cancer diagnoses [22]. There was no observed correlation between blood type and lung cancer. However, a study by David Ashley, similar to this study, observed an elevated occurrence of blood group A^+ and a reduced occurrence of blood group O^+ in patients with lung tumors [27].

The ABO blood group system plays an important role in the blood transfusion process for individuals with leukemia. According to study Husham Elzein, referred to blood type A^+ is the most common in cases of acute leukemia, while blood type O^+ is the most common in cases of chronic leukemia [28], However, this study conducted for the project, generally indicated that blood type O^+ the most common at (15%), while blood type A+ and B+ was at (17%).

Colon cancer represents 10% of the global cancer incidence [22]. One of the earliest investigations of the role of the ABO blood group in colon disease found blood group O^+ at a much higher frequency in patients with colon tumors [24], as this study showed an increase in blood group O^+ and AB^+ by (22% and 42%).
Prostatic cancers represent 8% of global cancer cases [22], and it has been reported that there is no association between blood group and the risk of prostatic cancer or survival at the tissue level [29]. However, a study for Wajsman Zew et al [30], similar to this study, showed a relationship between blood group A^+ (20%) and susceptibility to prostatic cancer. One of the studies indicates that the loss of antigen expression increases with tumor progression [31], and a separate study found that the lack of antigen expression for tissue blood group antigens in prostatic tumor tissues is not a sign of invasion [32].
Several researchers have concentrated their studies on the predictive significance of the ABO blood group in stomach cancer, bladder cancer and Pancreatic cancer patients, but the findings have been varied [33,34]. A certain team of researchers did not discover a substantial correlation between blood groups and bladder cancer [34,35]. This study also did not discover a substantial correlation between blood groups and stomach cancer, bladder cancer, and Pancreatic cancer, and did not discover a substantial correlation between negative blood groups and the previous eight cancers.

Conclusion

An association has been revealed between various ABO blood types and multiple types of diseases, including cancer. This study indicates a significant correlation between ABO blood groups and susceptibility to various types of cancer in Libyan society. Specifically, cancer patients with positive blood groups, particularly the O^+ blood group, were found to be more susceptible to cancer, followed by the A^+ blood group. However, no significant correlation was observed between negative blood groups and the cancer types analyzed in this study. It is essential to note that while ABO blood groups are strongly associated with cancer risk, they do not directly cause cancer but rather indicate increased susceptibility.

References

1. Vogel F. Controversy in human genetics. ABO blood groups and disease. Am J Hum Genet. 1970;22(4):464-75.
2. Costantini M, Fassio T, Canobbio L, Landucci M, Resasco M, Boccardo F. Role of blood groups as prognostic factors in primary breast cancer. Oncology. 1990;47(4):308-12. https://doi.org/10.1159/000226839.
3. Bonfiglio TA, Feinberg MR. Isoantigen loss in cervical neoplasia. Demonstration by immunofluorescence and immunoperoxidase techniques. Arch Pathol Lab Med. 1976;100(6):307-14.
4. Oh-Uti K. Polysaccharides and glycidamin in the tissue of gastric cancer. Tohoku J Exp Med. 1949;51(3-4):297-304. https://doi.org/10.1620/tjem.51.297.
5. Davidsohn I, Kovarik S, Lee SL. A-, B-, and O-substances in gastrointestinal carcinoma. Arch Pathol. 1966;81(5):381-90.
6. Bergman S, Javadpour N. Cell surface antigen A, B or O (H) as indicator of malignant potential in Stage A bladder carcinoma: Preliminary report. J Urol. 1978;119(1):49-51. https://doi.org/10.1016/s0022-5347(17)57378-4.
7. Garratty G. Blood groups and disease: A historical perspective. Transfus Med Rev. 2000;14(4):291-301. https://doi.org/10.1053/tmrv.2000.16228.
8. Winters JL, Howard DS. Red blood cell antigen changes in malignancy: Case report and review. Immunohematology. 2001;17(1):1-9. https://doi.org/10.21307/immunohematology-2019-533.
9. Xu YQ, Jiang TW, Cui YH, Zhao YL, Qiu LQ. Prognostic value of ABO blood group in patients with gastric cancer. J Surg Res. 2016;201(1):188-95.
10. Costantini M, Fassio T, Canobbio L, Landucci M, Resasco M, Boccardo F. Role of blood groups as prognostic factors in primary breast cancer. Oncology. 1990;47(4):308-12.
11. Annese V, Minervini M, Gabbrielli A, Gambassi G, Manna R. ABO blood groups and cancer of the pancreas. Int J Pancreatol. 1990;6:81-8.
12. Zhang BL, He N, Huang YB, Song FJ, Chen KX. ABO blood groups and risk of cancer: a systematic review and meta-analysis. Asian Pac J Cancer Prev. 2014;15(11):4643-50. https://doi.org/10.7314/apjcp.2014.15.11.4643.
13. He M, Wolpin B, Rexrode K, Manson JE, Rimm E, Hu FB, Qi L. ABO blood group and risk of coronary heart disease in two prospective cohort studies. Arterioscler Thromb Vasc Biol. 2012;32(9):2314-20. https://doi.org/10.1161/ATVBAHA.112.248757.
14. Franchini M, Mannucci PM. ABO blood group and thrombotic vascular disease. Thromb Haemost. 2014;112(6):1103-9. https://doi.org/10.1160/TH14-05-0457.
15. Franchini M, Lippi G. The intriguing relationship between the ABO blood group, cardiovascular disease, and cancer. BMC Med. 2015;13:7. https://doi.org/10.1186/s12916-014-0250-y.
16. Garratty G. Blood groups and disease: A historical perspective. Transfus Med Rev. 2000;14(4):291-301. https://doi.org/10.1053/tmrv.2000.16228.
17. Liumbruno GM, Franchini M. Hemostasis, cancer, and ABO blood group: the most recent evidence of association. J Thromb Thrombolysis. 2014;38:160-6.

18. Franchini M, Lippi G. The intriguing relationship between the ABO blood group, cardiovascular disease, and cancer. BMC Med. 2015;13:1-3.
19. Ewald DR, Sumner SC. Blood type biochemistry and human disease. Wiley Interdiscip Rev Syst Biol Med. 2016;8(6):517-35.
20. Garratty G. Blood groups and disease: a historical perspective. Transfus Med Rev. 2000;14(4):291-301.
21. Yamamoto F, Cid E, Yamamoto M, Blancher A. ABO research in the modern era of genomics. Transfus Med Rev. 2012;26(2):103-18.
22. World Health Organization. International agency for research on cancer. 2019.
23. Aird I, Bentall HH, Mehigan JA, Roberts JF. The blood groups in relation to peptic ulceration and carcinoma of colon, rectum, breast, and bronchus. Br Med J. 1954;2(4883):315.
24. Goldenberg IS, Hayes MA. Breast carcinoma and ABO blood groups. Cancer. 1958;11(5):973-4. https://doi.org/10.1002/1097-0142(195809/10)11:5<973::aid-cncr2820110517>3.0.co;2-w.
25. Miao SY, Zhou W, Chen L, Wang S, Liu XA. Influence of ABO blood group and Rhesus factor on breast cancer risk: A meta-analysis of 9665 breast cancer patients and 244 768 controls. Asia Pac J Clin Oncol. 2014;10(2):101-8.
26. Zhang BL, He N, Huang YB, Song FJ, Chen KX. ABO blood groups and risk of cancer: a systematic review and meta-analysis. Asian Pac J Cancer Prev. 2014;15(11):4643-50.
27. Ashley DJ. Blood groups and lung cancer. J Med Genet. 1969;6(2):183-6. https://doi.org/10.1136/jmg.6.2.183.
28. Elzein HO. Association of Leukemia With ABO Blood Group Distribution and Discrepancy: A Review Article. Cureus. 2024;16(3):e56812. https://doi.org/10.7759/cureus.56812.
29. Kvist E, Krogh J, Hjortberg P. Prognostic variables in patients with prostate cancer: influence of blood group ABO (H), the Rhesus system, age, differentiation, tumour stage and metastases. Int Urol Nephrol. 1992;24:417-23.
30. Wajsman Z, Saroff J, Murphy GP. Blood group distribution in prostatic cancer patients. J Surg Oncol. 1977;9(3):289-91.
31. Chastonay P, Hurlimann J, Gardiol D. Biological tissue markers in benign and malignant disease of the human prostate. Virchows Arch A. 1987;410:221-9.
32. Ghazizadeh M, Kagawa S, Takigawa H, Kurokawa K, Numoto S. Specific red cell adherence test in benign and malignant lesions of the prostate. Br J Urol. 1983;55(4):405-7.
33. Orihuela E, Shahon RS. Influence of blood group type on the natural history of superficial bladder cancer. J Urol. 1987;138(4):758-9.
34. Klatte T, Xylinas E, Rieken M, Rouprêt M, Fajkovic H, Seitz C, Karakiewicz PI, Lotan Y, Babjuk M, de Martino M, Shariat SF. Effect of ABO blood type on mortality in patients with urothelial carcinoma of the bladder treated with radical cystectomy. Urol Oncol. 2014;32(5):625-30. https://doi.org/10.1016/j.urolonc.2013.11.010.
35. Raitanen MP, Tammela TL. Relationship between blood groups and tumour grade, number, size, stage, recurrence and survival in patients with transitional cell carcinoma of the bladder. Scand J Urol Nephrol. 1993;27(3):343-7.