

Relationship between Haematological Malignancies and ABO Blood Groups: A Hospital Based Study

ABSTRACT

Background: The pattern and distribution of haematological malignancies varies depending on age sex and geographical location. Studies on association between haematological cancers and ABO blood types have been largely conflicting.

Aim: To determine if any, association between haematological malignancies and ABO blood types among a cohort of patients with haematological cancers.

Methods: This was a retrospective descriptive study involving the review of records of patients with various haematological cancers, their demographic characteristics and ABO blood groups over a 5 year period.

Results: The mean age of the patients was 47.93 ± 17.9 years. The peak age incidence for the various haematological cancer was the fourth and fifth decade of life. The male to female sex ratio was 2:1 comparable to other studies. NHL was the commonest haematological cancer among the patients. Majority of the patients were of the O-blood type, the different blood group distribution among the patients was statistically not different from that of the general population. Also there was no association between haematological cancers and ABO blood type of the patients.

Conclusion: The distribution, age and sex ratio of haematological malignancies in our study is comparable to those reported by other authors with NHL being the most common haematological cancer in our environment. There was no association between haematological cancers and ABO blood type of the patients.

Keywords: Haematological, Malignancies, Cancers, Blood group, ABO, Rh.

1.0 Introduction

Haematological malignancies are a group of cancers that affect the blood, bone marrow and lymph nodes. These cancers include; leukaemias which are sub-classified into acute leukaemia (acute lymphoblastic leukaemia [ALL] and acute myeloid leukaemia [AML]) and Chronic Leukaemia (Chronic lymphocytic leukaemia [CLL] and Chronic myeloid leukaemia [CML]), Myeloma and lymphomas (Non Hodgkin lymphoma [NHL] and Hodgkin lymphoma [HL]). [1]

33 The aetiology of haematologic cancers are largely unknown. However, the few risk factors
 34 identified account for a small proportion of cases [2, 3]. Globally, haematologic cancers
 35 account for 7.5% and 6.4% respectively of male and female cancers diagnosed worldwide
 36 [4]. In the United States, its account for about 6-8% of all diagnosed cancers in both sexes
 37 [5]. The prevalence is much less in Asian countries. In Korea for instance, it accounted for
 38 about 4.5% of all cancers [4]. In Africa, a study from Eastern Morocco reported a prevalence
 39 of 10.9% while a prevalence of 18.05 % was reported in Ilorin North-Central region of
 40 Nigeria [7, 8] when compared to other cancers.

41 The ABO blood group is by far the most important and most antigenic of the blood group
 42 system [9]. The antigens of this blood group system are defined by carbohydrate moieties
 43 expressed on the surface of the erythrocyte membrane [10]. However, in addition to the
 44 erythrocyte membrane, these antigens are also expressed on the surfaces of large number of
 45 normal human cells and tissues including body fluids as well as some tumours. [11, 12].

46 Right from the first study in 1953 that demonstrated an association between stomach cancer
 47 and blood group A [13], there have been several other studies on the plausible association or
 48 relationship of blood types to some disease conditions [14, 15]. For instance, kaffenberger
 49 et.al [16], in their study found that ABO blood group was independently associated with the
 50 overall survival of patients undergoing surgery for renal cell carcinoma. The non-O blood
 51 type was identified as independent predictor of mortality [16]. Similar findings though with
 52 subtle differences have been reported among other solid tumours [17, 18, 19].

53 Similarly, several studies have demonstrated an association between haematologic cancers
 54 and blood type though these studies have been largely inconsistent. [20.21.22] In a study that
 55 examine genetic predisposition of individuals to lymphoma and leukaemia with respect to
 56 their ABO blood types, found that among patients with leukaemia, those with CLL had an

57 increased frequency of the A2 blood phenotype while the blood group phenotype of those
58 with lymphoma was similar to those of the controls [20]. Iodices et.al [21] in their study on
59 blood group and cancer found a significant difference in the distribution of O blood type and
60 in HL and NHL. Also, in study to determine the distribution of ABO blood groups in acute
61 leukaemias and lymphomas, the authors found that there were 45.6% (95% CI 6.8-84.5) more
62 patients with HL who had B blood group and 14.3% (95% CI 3.2-25.3) more patients with
63 ALL who had O blood group compared to other blood groups respectively.

64 To the best of our knowledge no study has evaluated the relationship between ABO blood
65 groups and haematologic malignancies in our centre. Furthermore, if the risk of different
66 diseases and/or cancers are known for different ABO blood types, it could serve as a potential
67 epidemiological marker to identify at risk persons in the population. Thus, the objectives of
68 this study were to document the ABO blood types of patients suffering from different
69 haematologic malignancies and also to determine if any association of different types of
70 haematologic malignancies and ABO blood type as seen in our centre.

71 **2.0 MATERIALS AND METHODS**

72 ***2.1 Study Location:***

73 The study was conducted in the Department of Haematology, University of Uyo Teaching
74 Hospital, a tertiary referral health facility in the Niger Delta region of Nigeria. The
75 Department attends to adult patients with various haematologic disorders including
76 haematologic cancers.

77 ***2.2 Study Design:***

78 The study design was retrospective descriptive study set out to achieve the above objective.
79 Data of all haematologic malignancies seen in the department over a five year period were
80 reviewed. Information on the type of haematologic cancers, the age and sex of the subjects,

possible risk factors for cancer and their ABO blood types were extracted from patient's case files and recorded in a proforma designed for the study.

2.3 Inclusion and Exclusion Criteria:

The case-files of patients who had confirmed diagnosis of any of the haematologic malignancies and with complete clinical and laboratory information were used in the study. Case-files of patients with presumptive diagnosis and incomplete data were excluded from the study.

2.4 Ethical Consideration:

Ethical approval was obtained from The Institutional Health Research Ethical Committee of the Hospital before the commencement of the study.

2.5 Data Analysis

Data obtained was analysed using STATA software for windows version 10.0. Results were presented in simple tables. Descriptive statistics were used as appropriate and statistical significant levels was set at $p < 0.05$

3.0 RESULTS

The mean age of the subjects was 47.93 ± 17.9 years with a range of 17- 81 years. More than half of the subjects were males and married (54.6% and 57.6%) respectively. A quarter had secondary school education (41.7%) while a third (33.3%) was involved in one form of trading or business activity. Table 1

Table 1: Socio-demographic Characteristics of Subjects

Characteristics	Frequency	Percentage
Sex		
Males	72	54.6
Females	60	45.4
Age in years (Mean $\pm$ SD) 47.93 ± 17.9		
Marital Status		
Single	30	22.7
Married	76	57.6
Widowed	24	18.2
Separated/divorced	2	1.5

Educational level		
Primary	26	19.7
Secondary	55	41.7
Post-secondary	51	38.6
Occupational groups		
Students/housewife	18	13.6
Trading/business	44	33.3
Dependent/retirees	18	13.6
Civil servants	30	22.7
Artisans	11	8.3
Farming	4	3.0
Clergy	7	5.3

NHL was the most common (31.1%) haematologic malignancy, while CML was the most frequent leukaemia seen (25.8%). Table 2

Table 2: Types and Proportion of Haematologic Malignancies

Types	Frequency	Percent
CML	34	25.8
CLL	27	20.5
Non Hodgkin Lymphoma	41	31.1
Hodgkin Lymphomas	8	6.1
Multiple Myeloma	22	16.7

The peak age incidence of the various haematological malignancies occur majorly within the fourth to the fifth decades of life age brackets. However, HL was found predominantly among young adults. Table 3.

Table 3: Age Distribution of the various Haematological Malignancies

Age Group	CML	CLL	NHL	HL	MM	Total
17-26	7 (20.6)	0 (0.00)	4 (9.8)	3 (37.5)	1 (4.6)	15 (11.4)
27-36	2 (5.9)	1 (3.7)	7 (17.1)	1 (12.5)	0 (0.00)	11 (8.3)
37-46	12 (35.3)	5 (18.5)	10 (24.4)	1 (12.5)	5 (22.7)	33 (25.0)
47-56	6 (17.7)	9 (33.3)	9 (21.9)	1 (12.5)	8 (36.4)	33 (25.0)
57-66	1 (2.9)	6 (22.2)	5 (12.5)	1 (12.5)	3 (13.6)	16 (12.1)

67-76	5 (14.7)	5 (18.5)	5 (12.5)	0 (0.00)	5 (22.7)	20 (15.2)
77-86	1 (2.9)	1 (3.7)	1 (2.4)	1 (12.5)	0 (0.0)	4 (3.0)
Total	34 (100)	27 (100)	41 (100)	8 (100)	22 (100)	132 (100)

*CML=Chronic Myeloid Leukaemia CLL= Chronic lymphocytic Leukaemia, NHL=Non Hodgkin lymphoma, HL=Hodgkin Lymphoma, MM=Multiple Myeloma

Majority (58.3%) of the subjects were of the Rh O positive blood type while Rh B positive blood type was the list common (10.6%) among the subjects. Collectively, subjects with the O blood type were more than the non-O blood type. Table 3.

Table 4: The Different Blood Groups of Subjects

Characteristics	Frequency	Percent
Blood Groups		
O Rh Positive	77	58.3
A Rh Positive	41	31.1
B Rh Positive	14	10.6
O and Non O blood Groups		
O group	77	58.3
Non O group	55	41.7

CML (55.9%: 44.1%), NHL (68.3%: 31.7%), HL (87.5%:12.5%) was commoner among subjects with O blood type than the non-O while CLL (55.6%: 44.4%) was commoner among non O blood type Than the O blood type. However, this difference was not statistically significant (p=0.125). Both blood types (O and the non-O) was equally distributed among subjects with multiple myeloma. Also, except for CLL, the other haematologic malignancies were more common in male subjects than females. Table 4

Table 5: Association between selected Characteristics and types of Hematologic Malignancies

Factors	Types of Haematologic Malignancies					Total n(%)	Statistical tests and values
	CML n(%)	CLL n(%)	NHL n(%)	HL n(%)	MM n(%)		
Blood Grp							
O Rh +	19 (55.9)	12 (44.4)	28 (68.3)	7 (87.5)	11 (50.0)	77 (58.3)	X ² =7.328 P=0.125
Non O Rh+	15 (44.1)	15 (55.6)	13 (31.7)	1 (12.5)	11 (50.0)	55 (41.7)	
Sex							
Male	18 (52.9)	13 (48.2)	26 (63.4)	5 (62.5)	12 (54.5)	72 (54.5)	X ² =2.7193 P=0.605
Female	16 (47.1)	14 (51.8)	15 (36.6)	3 (37.5)	10 (45.5)	60 (45.5)	

*CML=Chronic Myeloid Leukaemia CLL= Chronic lymphocytic Leukaemia, NHL=Non Hodgkin lymphomas, HL=Hodgkin Lymphoma, MM=Multiple Myeloma

4.0 DISCUSSION

Several studies have described a link between ABO blood type and cancer risk. A number of plausible mechanism have been proposed for this link, however results from studies evaluating the prognostic relevance of ABO antigens in various haematologic cancers have been largely inconsistent. [20, 21, 22]

Non Hodgkin lymphoma was the most common haematological malignancy in this study. The high prevalence of NHL (31.1%) observed in this study is comparable to that observed in Ilorin, (42%), Benin City (33.5%) in North Central and South-South Regions of Nigeria respectively and Eastern Morocco (29.1%) [7, 8, 23]. Studies from the equatorial belt of Africa have reported similar findings with NHL being among the top ten haematologic malignancies [24].

Chronic leukaemia (CML & CLL) were the only form of leukaemia reported in this study. This is so because our study population were majorly young adults and above. This type of leukaemia is commoner among individuals in this age bracket. [25]. Multiple myeloma constitute about 16% of haematological malignancies in this study. This value is relatively higher than 8.3% reported by some other authors in Nigeria. [23], however this figure closely approximate with prevalence in Morocco and the general global prevalence [7, 26]. While environmental factors have been identified as the main determinants in the subtle variation in the incidence rate, certain pathogens especially those of viral origin have been equally implicated. [27, 28]

Gender wise, there was slightly more affected male patients than females, with a male to female ratio of 2:1. This findings is consistent with findings from other studies including studies from France and United Kingdom where male and female ratio was 1.2 and 1.3 respectively [29, 30]. However, a higher male to female sex ratio of 2.2 and 1.6 have equally

been reported. [31, 32]. Also, it is important to note that the sex ratio also varies within age group despite the slight male predominance.

Furthermore, majority of haematological malignancies were observed among patients in the fourth and fifth decades of life except for HL which was more prevalent in patients in late adolescent and early adulthood. This findings is similar to the study by Omoti et.al, [33] who reported a peak age incidence of between 46-59 years for patient with lymphoid malignancies. It is also in agreement with the study by Babatunde et.al who reported mean age incidences of patients with haematological malignancies to be largely in the fourth and fifth decades of life. [8]. However, in Western countries the disease affects older people usually in the seventh decade of life [34]. The differences observed in the age incidences in our clime and the developed countries could be attributed largely to our relatively younger population, shorter life expectancy among the populace due to poor socio-economic status and healthcare and environmental factors.

Various studies have reported inconsistent report on the distribution of blood types in Patients with haematological malignancies. [20, 21, 22] In this study majority of the patients were of the O-blood type while the non-O blood type were less than 50%. This pattern follows the typical ABO blood group distribution in the general population in our clime in whom over 50% are of the O-blood type [35]. Similar finding was reported by Janardhana et.al, [36]. CML and the lymphomas were commoner among patients with O-blood type while CLL was commoner among patients with non-O blood type, however this difference was not statistically significant ($p=0.125$). Our finding is consistent with the study by Steinberg et.al, [37] who observed that the blood group distribution in a cohort of 450 acute leukaemia patients was statistically not different from that of the general population. However, our findings contrast with a much earlier study by Shirley et.al, [38] who reported a correlation between the incidence of blood group A and leukaemia. It also contrast study by Tavasolian

et.al [39] who equally demonstrated that AB blood group was associated with a higher risk of ALL. The inconsistencies in the various studies including ours could largely be attributed to environmental and ethnic differences in the study populations. Studies involving ABO blood types in different populations have shown considerable variation in different geographic locations thus, reflecting both the underlying genetic and ethnic diversity of human populations [40].

5.0 CONCLUSION

The distribution, age and sex ratio of haematological malignancies in our study is comparable to those reported by other authors with NHL being the most common haematological cancer in our environment. Majority of the cancer patients were of the O-blood type and the different blood group distribution among the patients was statistically not different from that of the general population. Also, there was no association between haematological cancers and ABO blood type of the patients.

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