ASSOCIATION BETWEEN ABO BLOOD GROUPS AND MEDICAL CHARACTERISTICS FOR CHILDREN WITH LEUKEMIA ATTENDING HIWA CANCER HOSPITAL IN SULAIMANI CITY-IRAQ

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ABSTRACT

Background

Leukemia is a hematological malignancy or cancer of the blood; it develops in the bone marrow, the soft inner part of bones where new blood cells are made. In a child with leukaemia, the bone marrow produces white blood cells that do not correctly mature Childhood leukaemia is the most common cancer, accounting for 29% of cancers in children; many studies were summarized that there is a strong correlation between the ABO groups and childhood leukaemia.

Objectives

To identify the association between ABO Blood Groups and Medical Characteristics for Children with leukaemia Attending Hiwa Cancer Hospital in Sulaimani City.

Methods

A Quantitative-descriptive study has been carried out on (100) children diagnosed with leukaemia from Aug 1, 2019, to the end of March 2020 at Hiwa cancer Hospital in Sulaimani City/Iraq Questionnaire form conducted by the researcher for data collection Data analyzed by using statistical package of social science (SPSS) version 21.

Results

Main findings in the present study shows that (66%) of patients with leukaemia were males, ABO blood group distribution were 38% (O), 29% (A), 24% (B), and 9% (AB). Significant relationships were found between pediatric patients' blood groups and their socio-demographic characteristics interim of residency and type of family. In addition, significant relations were found between the patient's blood groups and medical characteristics regarding the type of leukaemia and both mother and father blood groups at ($p<0.05$).

Conclusion

Findings in the present study concluded that is leukaemia more common among the type O blood group, followed by type A and B blood group. In addition, significant associations were found between case and control groups with their ABO blood group and type of leukaemia, mother's blood group, and father's blood group with ABO blood group.

Keywords: *ABO blood group, Childhood leukaemia, Medical characteristics.*

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INTRODUCTION

Leukaemia is a neoplastic proliferation or accumulation of hematopoietic cells with or without the involvement of the peripheral blood. In most cases, leukemic cell spills over the blood can be seen in large numbers. These cells may also infiltrate the liver, spleen, lymph nodes, and other tissues [1].

Acute lymphoblastic leukaemia (ALL) is a form of leukaemia or cancer of the white blood cells characterized by excess lymphoblast's malignant immature white blood cells continuously multiply and is overproduced in the bone marrow ALL is most common in childhood with a peak incidence at 2-5 years of age, and another peak in old age [2] Acute myeloblastic leukaemia (AML) includes about 15% of leukaemia cases and has a poorer prognosis in comparison to childhood ALL, In recent decades, the survival rate of children with leukaemia has dramatically increased because of improvements in diagnostic tools and therapeutic protocols[3].

The term "blood group" refers to the entire blood group system comprising red blood cell (RBC) antigens. Its specificity is controlled by a series of genes that can be allelic or linked very closely on the same chromosome. "Blood type" refers to a specific pattern and disease association with RBC surface antigens. Karl Landsteiner has been credited for the discovery of the ABO blood group system in 1900 [4].

Several well-known associations exist between ABO blood groups and certain diseases. For example, gastric carcinoma is found to occur in most persons with the A blood group. In contrast, duodenal ulcers are found to occur more commonly among persons with the O blood group [5].

PATIENTS AND METHODS

A Quantitative-descriptive design (cross-sectional) has been carried out in Hiwa Cancer Hospital to assess the relationship between patients' and parents' medical characteristics with ABO blood groups among Childhood Leukemia. This study accepted by the Scientific Committee at the College of Nursing, and accordingly approved by ethical committee at College of Medicine/University of Sulaimani An official letter has been submitted from the College of Nursing/University of Sulaimani to the General Directorate of Health (DOH) in Sulaimani in order to obtain agreement for the purpose of data collection Consequently, agreement letter has been submitted from the directorate of health (DOH) to Hiwa Cancer Hospital A non-probability, purposive sample technique was used, 100 pediatric cancer patients and their parents have been selected from consecutive attendances to out-patient unit and in-patients at Hiwa Cancer Hospital A questionnaire was used to conduct this study which consists of socio-demographic characteristics of studied sample both children and their parents include: age, gender, birth order, school level, twin pregnancy, and medical characteristics for both patients and parents include: patient blood groups , age of child during diagnosis, congenital anomaly, Content validity of the questionnaire was determined through a panel of 15 experts, whom asked to review the questionnaire's items for clarity, adequacy and relevancy for the purpose of data collection, inpatients and outpatients were selected during their visit to Hiwa Cancer Hospital and according to inclusion criteria prior to interview, first an introduction was given and the purpose of the research explained by the researcher in order to obtain verbal informed consent Second, face to face interview was held by the researcher with the subjects through using the constructed questionnaire at Hiwa cancer hospital Data encoded and entered to the excel sheet prior to analysis Data was analyzed using SPSS version 21, according to the objectives of the study First, descriptive statistics (frequency, percentage, mean and standard deviation) was used, and then inferential statistics (Pearson Coefficient Correlation and Chi-square) was used to determine the statistical association of ABO blood groups with socio-demographic characteristics and medical characteristics of the study sample. There is a certain set of probability (p-value) that indicated the degree of significance in the present study as follows not significant ($P>0.05$), significant ($P\leq0.05$), highly significant ($P< 0.01$).

RESULTS

Table (1) shows that (43%) of the sample were aged between (5-8) years old with a mean of age (7.14) years old, (66%) of the sample were male, more than half of the sample were first and second birth order, the vast majority of type of family were nuclear family, exactly three-quarter of the sample was Kurdish ethnicity, more than half of sample have barely sufficient economic status, (60%) of the sample were living in urban and very few percentages of the sample were living in rural, (38%) of sample their blood groups were (O).

Table (2) shows that (54%) of mothers' age were between (25-37) years old, the highest percentage of mothers'

occupation was housewife, (47%) of fathers their age ranged between (41-50) years old, (57%) of fathers have a free job, (47%) of mothers were marred between (18-22) years old, about mother age at pregnancy (49%) of them became pregnant between age (18-27) years old, and (70%) of them have no consanguinity between parents.

Table (3) represents the association between patient socio-demographic characteristics and their blood groups; the results show that statistically significant associations were found between blood groups, type of family, and residency (p-value <0.05). At the same time, no statistically significant association was found between ABO blood groups with the child's age, gender, birth order, ethnicity and economic status at a p-value more than 0.05.

Table (4) reveals the association between Parents Socio-demographic characteristics and patient blood groups; the findings explain that there was no statistically significant association found between child ABO blood groups and mother age, mother occupation, father age, father occupation, mother age at marriage, maternal age at pregnancy and consanguinity between parents at p-value was more than 0.05.

Table (5) explore the association between patients' medical characteristics and their blood groups, the statistically significant association between patient ABO blood groups and type of leukaemia at (p-value <0.05) While no statistically significant association were found between patient blood groups and patients age at diagnosis, congenital anomaly, gestational age, type of delivery, and vaccination at p-value more than 0.05.

Table (6) demonstrates a highly significant association between parents' blood groups and patients' blood groups at p-value<0.05. However, it is worth mentioning that no significant association were found between the patient's blood groups and parents' chronic disease, family history of cancer, father smoking, and mother receiving folic acid during pregnancy at a p-value more than 0.05.

Table (7): This table shows that demonstrate the samples in both case and control groups; about blood groups among leukemic children, 37% were (O+), 29% were (A+), and 24% were (B+), on the other hand in the control group 36% of children were blood groups (A+), 35% were (O+), and 14% of children were blood groups (B+), and in both case-control groups (Rh-) recording the lower percentage of sample Statistically highly significant association we found between case and control groups about their ABO blood groups (p-value<0.05).

Table 1. Distribution of sample according to patients socio-demographic.

Variables	Items	Frequency	Percent
Age (year)	1 – 4	25	25
	5 – 8	43	43
	9 – 12	22	22
	13 – 17	10	10
	Mean ±SD	**7.14 ± 3.57**	
Gender	Male	66	66
	Female	34	34
Birth Order	1-2	52	52
	3-4	32	32
	5-6	10	10
	7-8	6	6
	Mean ±SD	**2.82 ± 1.76**	
Type of family	Nuclear	95	95
	Extended	5	5
Ethnicity	Kurdish	75	75
	Arabic	25	25
Economic status	Sufficient	30	30
	Barely sufficient	57	57
	Insufficient	13	13
Residency	Urban	60	60
	Suburban	33	33
	Rural	7	7
Patient blood groups	O	38	38
	A	29	29
	B	24	24
	AB	9	9
Total		**100**	**100%**

Table 2. Distribution of sample according to parents socio-demographic characteristics.

Variables	Items	Frequency	Per cent
Mothers' age (year)	25 >	6	6
	25-37	54	54
	38-50	39	39
	50 <	1	1
	Mean ±SD	**35.71 ± 6.58**	
Mothers' occupation	Housewife	85	85
	Governmental employee	12	12
	free job	3	3
Fathers' age (year)	30 >	6	6
	30-40	43	43
	41-50	47	47
	50 <	4	4
	Mean ± SD	**40.75 ± 6.99**	
Fathers' occupation	Governmental employee	40	40
	free job	57	57
	Jobless	3	3
Mother age at marriage (Year)	18 >	18	18
	18-22	47	47
	23-27	25	25
	27 <	10	10
	Mean ±SD	**21.45 ± 4.7**	
Mother age at pregnancy (year)	18 >	1	1
	18-27	49	49
	28 -37	39	39
	37 <	11	11
	Mean ±SD	**28.74 ± 6.02**	
Consanguinity between parents	Yes	30	30
	No	70	70
Total		**100**	**100%**

Table 3 . Association between Patients Socio-demographic characteristics and their blood groups.

Variables	Items	O N (%)	A N (%)	B N (%)	AB N (%)	Total	χ2-Square (P-vale)
Age	1 – 4	7(28)	8(32)	9(36)	1(4)	25	
	5 – 8	16(37.2)	12(27.9)	10(23.3)	5(11.6)	43	χ2=5.99 (0.741)
	9– 12	11(50)	5(22.7)	4(18.2)	2(9.1)	22	
	13–17	4(40)	4(40)	1(10)	1(10)	10	
Gender	Male	22(33.3)	21(31.8)	16(24.2)	7(10.6)	66	χ2=2.205 (0.531)
	Female	16(47.1)	8(23.5)	8(23.5)	2(5.9)	34	
Birth Order	1-2	18(34.6)	16(30.8)	11(21.2)	7(13.5)	52	
	3-4	12(37.5)	8(25)	10(31.2)	2(6.2)	32	χ2=7.067 (0.63)
	5-6	4(40)	3(30)	3(30)	0(0.0)	10	
	7-8	4(66.7)	2(33.3)	0(0.0)	0(0.0)	6	
Type of family	Nuclear	33(34.7)	29(30.5)	24(25.3)	9(9.5)	95	χ2=8.587 (0.035)
	Extended	5(100)	0(0.0)	0(0.0)	0(0.0	5	
Ethnicity	Kurdish	28(37.3)	25(33.3)	15(20)	7(9.3)	75	χ2=4.015 (0.26)
	Arabic	10(40)	4(16)	9(36)	2(8)	25	
Economic status	Sufficient	10(33.3)	9(30)	7(23.3)	4(13.3)	30	
	Barely sufficient	21(36.8)	18(31.6)	13(22.8)	5(8.8)	57	χ2=4.11 (0.662)
	Insufficient	7(53.8)	2(15.4)	4(30.8)	0(0.0)	13	
Residency	Urban	26(43.3)	9(15)	18(30)	7(11.7)	60	
	Suburban	11(33.3)	15(45.5)	5(15.2)	2(6.1)	33	χ2=16.828 (0.01)
	Rural	1(14.3)	5(71.4)	1(14.3)	0(0.0)	7	

Table 4 . Association between Parents Socio-demographic characteristics and patients' blood groups.

Variables	Items	O N (%)	A N (%)	B N (%)	AB N (%)	Total	χ2-Square (P-vale)
Mothers' age (year)	25 >	2(33.3)	3(50)	1(16.7)	0(0.0)	6	**χ2=5.478 (0.791)**
	25-37	21(38.9)	14(15.9)	12(22.2)	7(13)	54	
	38-50	14(35.9)	12(30.8)	11(28.2)	2(5.1)	39	
	50 <	1(100)	0(0.0)	0(0.0)	0(0.0)	1	
Mother occupation	Housewife	34(40)	26(30.6)	19(22.4)	6(7.1)	85	**χ2=10.365 (0.11)**
	Governmental employee	3(25)	1(8.3)	5(41.7)	3(25)	12	
	free job	1(33.3)	2(66.7)	0(0.0)	0(0.0)	3	
Fathers' age (year)	30 >	2(33.3)	1(16.7)	2(33.3)	1(16.7)	6	**χ2=3.601 (0.936)**
	30-40	18(41.9)	13(30.2)	10(23.3)	2(4.7)	43	
	41-50	17(36.2)	14(29.8)	11(23.4)	5(10.6)	47	
	50 <	1(25)	1(25)	1(25)	1(25)	4	
Father occupation	Housewife	17(42.5)	14(35)	6(15)	3(7.5)	40	**χ2=6.874 (0.333)**
	Governmental employee	21(36.8)	13(22.8)	17(29.8)	6(10.5)	57	
	free job	0(0.0)	2(66.7)	1(33.3)	0(0.0)	3	
Mothers' age at marriage	18 >	9(50)	6(33.3)	2(11.1)	1(5.6)	18	**χ2=14.49 (0.106)**
	18-22	18(38.3)	16(34)	11(23.4)	2(4.3)	47	
	23-27	6(24)	5(20)	8(32)	6(24)	25	
	27 <	5(50)	2(20)	3(30)	0(0.0)	10	
Mothers' age at pregnancy(year)	18 >	1(100)	0(0.0)	0(0.0)	0(0.0)	1	**χ2=4.317 (0.889)**
	18-27	19(38.8)	14(28.6)	10(20.4)	6(12.2)	49	
	28 -37	13(33.3)	12(30.8)	11(28.2)	3(7.7)	39	
	37 <	5(45.4)	3(27.3)	3(27.3)	0(0.0)	11	
Consanguinity between parents	Yes	13(43.3)	8(26.7)	7(23.3)	2(6.7)	30	**χ2=0.668 (0.881)**
	No	25(35.7)	21(30)	17(24.3)	7(10)	70	

Table 5 . Association between Patients medical characteristics and their blood groups.

Variables	Items	O N (%)	A N (%)	B N (%)	AB N (%)	Total	χ2-Square (P-vale)
Type of leukaemia	ALL	37(40.2)	23(25)	24(26.1)	8(8.7)	92	χ2=10.038 (0.018)
	AML	1(12.5)	6(75)	0(0.00	1(12.5)	8	
Age at diagnosis (year)	1 – 5	22(37.3)	15(25.4)	16(27.1)	6(10.2)	59	χ2=2.879 (0.824)
	6 – 11	12(400	9(30)	7(23.3)	2(6.7)	30	
	12 – 17	4(36.4)	5(45.5)	1(9.1)	1(9.1)	11	
Congenital anomaly	Yes	1(33.3)	2(66.7)	0(0.0)	0(0.0)	3	χ2=2.551 (0.466)
	No	37(38.1)	27(27.8)	24(24.7)	9(9.3)	97	
Gestational age	full term	35(38.5)	28(30.8)	19(20.9)	9(9.9)	91	χ2=8.952 (0.176)
	Preterm	2(25)	1(12.5)	5(62.5)	0(0.0)	8	
	Post term	1(100)	0(0.0)	0(0.0)	0(0.0)	1	
Type of delivery	NVD	21(40.4)	19(36.5)	9(17.3)	3(5.8)	52	χ2=5.563 (0.135)
	C/S	17(35.4)	10(20.8)	15(31.2)	6(12.5)	48	
Vaccination	Yes	36(37.5)	28(29.2)	23(24)	9(9.4)	96	χ2=0.558 (0.906)
	No	2(50)	1(25)	1(25)	0(0.0)	4	

Table 6 . Association between Parents medical characteristics and patients' blood groups.

Variables	Items	O N (%)	A N (%)	B N (%)	AB N (%)	Total	χ2-Square (P-vale)
Mother blood groups	O +	27(75)	5(13.9)	4(11.1)	0(0.0)	36	
	A +	5(17.9)	16(57.1)	4(14.3)	3(10.7)	28	
	B +	4(20)	2(10)	12(60)	2(10)	20	
	AB+	0(0.0)	3(33.3)	2(22.2)	4(44.4)	9	χ2=73.924 (0.001)
	O -	0(0.0)	1(100)	0(0.0)	0(0.0)	1	
	A -	1(33.3)	2(66.7)	0(0.0)	0(0.0)	3	
	B -	0(0.0)	0(0.0)	1(100)	0(0.0)	1	
	AB -	1(50)	0(0.0)	1(50)	0(0.0)	2	
Father blood groups	O +	28(68.3)	5(12.2)	7(17.1)	1(2.4)	41	
	A +	5(15.2)	19(57.6)	4(12.1)	5(15.2)	33	
	B +	3(15.8)	3(15.8)	12(63.2)	1(5.3)	19	χ2=67.181 (0.001)
	AB+	0(0.0)	1(33.3)	0(0.0)	2(66.7)	3	
	O -	2(66.7)	0(0.0)	1(33.3)	0(0.0)	3	
	B -	0(0.0)	1(100)	0(0.0)	0(0.0)	1	
Mother chronic disease	Yes	4(40)	4(40)	2(20)	0(0.0)	10	χ2=1.549 (0.671)
	No	34(37.8)	25(27.8)	22(24.4)	9(10)	90	
Father chronic disease	Yes	0(0.0)	3(42.9)	3(42.9)	1(14.2)	7	χ2=4.707 (0.195)
	No	38(40.9)	26(28)	21(22.6)	8(8.6)	93	
Family history for cancer	Yes	28(35)	26(32.5)	17(21.2)	9(11.2)	20	χ2=6.147 (0.105)
	No	10(50)	3(15)	7(35)	0(0.0)	80	
Father smoking	Yes	19(50)	9(23.7)	9(23.7)	1(2.6)	38	χ2=5.684 (0.128)
	No	19(30.6)	20(32.3)	15(24.2)	8(12.9)	62	
Mother receive folic acid during pregnancy	Yes	14(35)	14(35)	9(22.5)	3(7.5)	40	χ2=1.215 (0.749)
	No	24(40)	15(25)	15(25)	6(10)	60	

Table 7 .Association between case & control groups concerning their ABO blood groups.

Variables	Items	Case group (N=100) N (%)	Control group (N=200) N (%)	Total	χ2-Square (P-vale)
Patient blood group	O+ve	37(37)	70(35)	107	
	A+ve	29(29)	72(36)	101	
	B+ve	24(24)	28(14)	52	
	AB+ve	8(8)	12(6)	20	**χ2=14.241 (0.047)**
	O-ve	1(1)	9(4.5)	10	
	A-ve	0(0.0)	4(2)	4	
	B-ve	0(0.0)	5(2.5)	5	
	AB-ve	1(1)	0(0.0)	1	

DISCUSSION

Analysis of the present study indicates that the highest percentage of the sample's age ranged between (5-8) years old with mean age (7.14± 3.57). The result of the current study is inconsistent with the findings of the study in Iraq; conducted they found that the high percentage of their participants' age was ranged between (1-10) years old [6].

In terms of gender, the proportion of males was accounted as two-thirds of the sample, which is agreed with the study done in Baquba, which found that males were nearly two-thirds of a sample of the study [7] More than half of the sample were first and second birth Order followed by third and fourth birth order which record One-third of the sample, the finding in agreement with the result of the study done in the United States who found that first and second birth order record the highest percentage than the other birth orders [8]. Regarding the type of the vast family majority of the sample was the nuclear family. Three-quarters of the sample size were Kurdish ethnicity followed by only one-quarter of the sample Arabic ethnicity; the finding agrees with the study results conducted in Sulaimani, which found 92% of the sample were Kurdish ethnicity [9].

More than half of the sample their economic status was barely sufficient followed by sufficient, this result supported by findings of their sample conducted in 2006 which found that less than three-quarters of their sample have middle socioeconomic status[10] About residency highest percentage of the sample were living in urban followed by one-third of them were living in suburban, it's worth to mention that proportion of rural residency records the lowest percentages of the sample, without doubt, the urban environment is one of the risk factors that cause most of the disease especially cancer, fewest percentage of the sample were from rural which are inconsistent with a study conducted in Taiwan, they showed that most of the sample live in an urban area [11].

Regarding patients' blood groups, more than one-third of samples their blood groups were (O), more than one-quarter of the sample was blood groups (A), and approximately one-quarter of them were stated as blood groups (B), it's worth mentioning that fewest percentage of the sample was blood group (AB, this finding is in agreement with the result of the study done in Iran they found that highest percentage of the sample were stated as blood groups (O), and fewest percentage of the sample were blood group (AB) [12].

Regarding parents' socio-demographic characteristics, more than half of mothers' ages ranged between (25-37) with mean age (35.7± 6.58) years.

Also, approximately half of the father's ages in the current study were ranged between (41-50) with mean age (of 40.75 ± 6.99) year. The result was disagreed for maternal age and agreed for fathers age with the study done in 2018, as they mention that high percentage of parent's age was ranged between (36-45) years old [13] .The highest percentage of mothers were housewives and more than half of father has a free job (non-governmental employee), which agree with the result of the study done in Erbil, they found that close to three-quarters of parents' occupations were unemployed [14].

Approximately half of the mother's age was ranged between (18-22) years old when married, followed by less than one-quarter of maternal age was less than (18) years old when married. In terms of mothers' age at pregnancy, approximately half of mothers are between (18-27) years old, only one percent of mothers age was less than (18) years old when they become pregnant.

The results are inconsistent with the study conducted in Brazil, which found that more than half of mothers' ages were ranged between (20-29) years old when they became pregnant [15]. About consanguinity between parents, less than three-quarters of the sample were non-consanguineous; their findings disagreed with the study done in the United Arabic kingdom. Their results were more than three-quarters of the sample consanguineous between parents [16].

In regard to the association between patient's blood groups and the patient socio-demographic characteristics, the results shows that there were no statistically significant association between ABO blood groups and age of child, gender, birth order, economic status and ethnicity because the result of the p-value was more than 0.05 About gender, the study done in Iran(12) supported the present finding, in term of birth order finding of the study done in 2019 disagree with the current finding[17] In regard to economic status result study done in 2006 agreed with the finding in the present study which found that no statistical significant association were found between childhood leukemia and their economic status[18] It's worth to mention that statistically significant associations were found between ABO blood groups with type of family and residency at (p-value <0.05) Findings agreed with the study done in Taiwan whom found a significant association between risks of childhood leukemia with urbanization [19].

Concerning the association between parents' socio-demographic characteristics and patient blood groups, the findings show that there were no statistically significant associations were found between patients' blood groups and mother age, mother occupation, father age, father occupation, mothers age at marriage, maternal age at pregnancy and consanguinity between parents at p-value more than 0.05, the result of the study done in New York found that Paternal age was not associated with childhood cancers [20] Another study done in Syria found no statistical association between consanguinity and parents with leukemic children [21].

Relevant to association between patient medical characteristics and patient's blood groups, the results reveals that statistically significant association between patient blood groups with type of leukemia were found at (p-value less than <0.05), finding supported with the study done in Bosnia and Herzegovina showed that significant association between childhood leukemia and ABO blood groups [22] While no statistically significant association were found between patient blood groups with patients age at diagnosis, congenital anomaly, gestational age, type of delivery, and vaccination because the result of the p-value was more than the typical alpha 0.05, results of the study done in 2008 revealed the present findings found that congenital anomaly more common in Down syndrome[23] Statistically no significant association between gestational age and childhood leukemia were found in present study, this finding incompatible with the study done in Ireland [24] Concerning vaccination result of the study done in 2017 support the current findings stated that no significant association between vaccination and childhood leukemia [25].

Regarding the association between Parents medical characteristics and patient blood groups, the results indicates that there were statistically significant association found between patient's blood groups with mother and father blood groups at (p-value <0.05) While no statistically significant association found between patients' blood groups with Mother and Father chronic disease, family history for cancer, father smoking, and mother receive folic acid during pregnancy, finding of the study done in Minnesota (America) supported the present findings whom found that no significant association between parental chronic disease and childhood leukemia [26] About association between family history for cancer and ABO blood groups the results agreed with the findings of the study done in France they found no significant association [27] In terms of father smoking, current findings disagree with the study done in 2006 they found a significant association between father smoking and childhood leukemia [28] Finally in regard to mother received folic acid during pregnancy the finding disagreed with the study done in 2012 they found the significant association between mother received folic acid during pregnancy and childhood leukemia [29].

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