RESEARCH ARTICLE

Statistical Approach to Discovery of Factors Impacting on Emergence of Blood Cancers in Iran

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Abstract

Cancer is now the main cause of increasing mortality throughout the world. Minor alterations in the cell cycle which are inherited and not removed by apoptosis are important rsik factors. Blood cancers are asmong the types which most readily cause death. Here in this study, usual but important factors such as age, gender, Rh and ABO blood typing, weight, and platelet counts are analyzed for impact on blood cancers. Frequencies and distributions, correlations and chi-square test were utilized in order to clarify the perspective of important factors. Our statistical results show males and females to have same risk in blood cancer but A blood type (40%) along with positive Rh (73%) had the highest risk. Low platelet counts are related to more than 80% of cases. Obesity has a statistically ignorable role in blood cancer prevalence. The fact that blood cancer cases increase during the second decade of life (45.7%) which might be because of involvement of maturation processes.

Keywords: Blood cancer - statistical approach - age - gender

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Introduction

Cancer is the main cause of increasing mortalities in the developing world. Cancers are usually caused by alterations within signaling pathways of specific cell lines or malfunctions of genetic materials of these cells (Ron et al., 1994; Jemal et al., 2008). Cancer can occur in different tissues such as liver, kidney, skin, guts or etc. benign forms of cancer usually are called tumors which are able to be removed by surgery or localized radiotherapy. Malignant cancer forms often spread through blood vessels into various body organs. This process is technically called metastasis (American Cancer Society, 2011). Among different cancer types blood cancer or leukemia has metastasis in its nature. Cancerous cells are immature unscreened white blood cells which are produced in high numbers by bone marrow stem cells (Sandler 1995; Jackson et al., 1999). This kind of cancer can be divided into different subtypes according to its origin and emerged cell types. Some important and statistically abundant blood cancer types are acute myelogenous leukemia (AML which is known as ANLL too), Chronic Myelogenous Leukemia (CML), Chronic Lymphocytic Leukemia (CLL) and Acute Lymphocytic Leukemia (ALL) (Löwenberg 2003; World Health Organization 2009). Blood cancer is the most adjacent one for treatments because malicious stem cells have to be destroyed or replaced with fresh cells from a donor. Often chemotherapy or radiotherapy is prescribed for such diseases but in less severe cases bone marrow stem cell transplantation is utilized (Jackson et al., 1999).

Identifying impacting factors upon causes of cellular alterations which lead to uncontrolled cell cycle repetitions have the most important role in reduction of cancer prevalence cases. These circumstantial preventions not only decrease therapy costs but also enhance the health level of society (Zand et al., 2010). This study focuses on analysis of some statistically important factors such as age, gender, weight, blood groups, plaque counts, and locations which could be related to generation of blood cancers (Nishi et al., 1996; Zand et al., 2010).

Materials and Methods

This research is based on a statistical study managed in oncology and hematology wards of *Shariati* hospital, Tehran during 2009-2010. Referred patients were given informed consent by hospital officials in order to fill out previously designed questionnaire which was including first and last name, age, gender, weight, Rh and ABO blood groups, platelet counts, living location and blood cancer type. Totally 745 patients accepted to go through study. Two quantitative and qualitative categories were designed for studied factors. All factors were carefully ranged based on accepted universal scales.

Categorization of studied factors makes it easier to

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Table 1. Adjusted Frequencies of All Factors

Parameter		Frequencies
Blood Cancer:	AML	44.7%
	ALL	21.3%
	Lymphoma	6.9%
	Other	13.8%
	Post -B.M.T.	13.3%
Gender:	Male	58.1%
	Female	41.9%
Rh B.G:	Positive	72.8%
	Negitive	27.2%
ABO B.G:	A	33.1%
	B	16.4%
	AB	25.8%
	O	24.7%
Age:	1-15	11.6%
	16-30	45.6%
	31-45	24.8%
	46-60	14.9%
	61-75	4.1%
Pt count:	$x<5\times10^4$	61.2%
	$5\times10^4<x>10^5$	20.8%
	$10^5<x>1.5\times10^5$	10.9%
	$1.5\times10^5<x>2\times10^5$	4.7%
	$2\times10^5<x>2.5\times10^5$	1.6%
	$2.5\times10^5<x>3\times10^5$	0.8%
Weight:	10-20	3.4%
	21-30	3.6%
	31-40	2.7%
	41-50	10.3%
	51-60	22.0%
	61-70	23.4%
	71-80	17.3%
	81-90	11.1%
	91-100	6.2%

work with qualitative elements that cannot be numbered or given to softwares in their original forms. All analysis processes were accomplished by SPSS software version 16, SPSS Inc. Frequencies, Distributions, Correlations, Cross-tabs, Chi-Squares were calculated for achieving a wise and clear perspective of impacting factors. Locations were not analyzed in detail and ignored from results because they are going to be published in coming research articles together with GIS information that include coordinates of cities and mines or other geological phenomena.

Blood cancers are classified into 5 AML, ALL, Lymphoma, Post-BMT and "Others" which include less severe and rare cancers such as Burkitt, NHL, MDS, and Hodgkin. Some of factors are normalized or adjusted for data misses in questionnaires.

Table 3. Frequencies of Different Cancer Types in Age Ranges

		Age Ranges					Total
		1-15	16-30	31-45	46-60	61-75	
CT:	AML	13	146	95	66	12	332
	ALL	11	97	36	12	2	158
	Lymphoma	7	23	7	7	7	51
	Others	9	32	32	19	7	99
	Post-BMT	38	39	13	6	2	98
Total		78	337	183	110	30	738

Results

This study included somehow an equal numbers of males and females. Normalized and adjusted forms of frequencies are mentioned in Table 1. Respectively, 4%, 1.1% and 0.9% of Rh and ABO blood grouping and age data were missed. These facts seem to be missed by patients or filled out incorrectly.

Analysis on cancers shows that the most abundant blood cancer among patients is AML that include 44.7% of total cases but according to Chi-Square test shown in Table 2 cancer types and gender are completely independent. Studies on Rh blood typing system reviled a high dependency between blood cancer prevalence and positive Rh. This reliance is about 73.1%. The highest negative Rh concentrated in AML group. Cancer and Rh blood groups are classified in Tables 2.

Cancer frequencies in different ABO blood groupings are showed shows that B blood type has the lowest distribution over Blood cancer types with 16.4% except in lymphoma. A blood type is the most abundant blood group in patients with 33.1%. Lymphoma is the rarest cancer type in this study with 6.8%. Table 2 represents the possible relationship between blood cancer and ABO blood group typing which is about 40%.

As it is visualized in Table 3, analysis on age and cancer reveals that it does not depend on age and could occur in any time. However Table 3 indicates the initiation time of happening which is about 16-30 with 45.7% of all cases.

Platelets are of the most important elements of blood clotting system which must be more than 2×10^5 in usual cases. Distribution of patients with different cancers in platelet count ranges that indicate an enormous decrease in platelet counts according to over production of immature white blood cells. More than 61% of patients suffer from sever platelet deficiency (data not shown). Table 2 indicates higher than 88% dependency between cancer and platelet counts.

Table 2. Dependency Tests for Cancer Types and Other Factors

Factor Analysis	Pearson Chi-Square			Likelihood Ratio			Linear-by-Linear Association		
	Value	df	Asymp. Sig.	Value	df	Asymp. Sig.	Value	df	Asymp. Sig.
Gender and Cancer Type	24.997	4	0	25.173	4	0	0.871	1	0.351
Rh Blood Group and Cancer Type	2.027	4	0.731	2.03	4	0.73	0.065	1	0.798
ABO Blood Group and Cancer Type	12.526	12	0.404	13.097	12	0.362	0.271	1	0.603
Age and Cancer Type	151.546	16	0	125.424	16	0	22.687	1	0
Platelet Count Range and Cancer Type	12.788	20	0. 886	13.96	20	0.833	1.076	1	0.3
Weight and Cancer Type	36.071	32	0.284	40.852	32	0.136	0.089	1	0.766

According to Table 2, cancer and weight seem to be more independent than dependent because the significance of the test is even less than 30.

Discussion

This study maneuvered on the idea that if some usual but important human characteristics such as age, gender, ABO and Rh blood groups, weight and platelet counts are important in generation of blood cancer. Here sophisticated statistical tests are used in order to exactly determine the roles and effects of mentioned factors. Most blood cancers in Iran are ALL and AML which seem to have the same origin. Cancers are cautiously classified into 5 groups according to their severity and predominance (Zand et al., 2010). Age is always ranged in 10 or 15 years manner but here 15 years scaling is chosen in order to improve presentation of the real result. Weight scaling was first intended to be each 20 kilograms but analysis was the same as now (Rai et al., 1981; Howlader et al., 2008). As it is represented in results blood cancer highly correlates with RH. In spite of all vagaries and yet published information about higher risks of blood cancer in males, it is proved that gender does not affect blood cancer prevalence. However ABO blood typing has moderate impact on making one prone to blood cancer because both of these factors are directly in contact with blood and its characteristics. Results proved the higher risks of Rh+ people for blood cancer as it is published before but on the other hand underlines higher risks of A blood type which is different from universal ideas (Zand et al., 2010; SEER Cancer Statistics Review, 2011). Rate of cancerous cases increases after the first decade of the life which supposes the probable role of maturation procedure or nature of such cancers. Low numbers of platelets is an important symptom of blood cancer which must be analyzed along with other symptoms such as inflammations, bleeding and etc, otherwise might be mistaken with a usual anemia. Weight and its impacts on blood cancer can be ignored because of its low significance in chi-square test. However over weighting can be the cause of blood cancer because of conversion of bone marrow stem cells to adipocytes because of high exposure with fatty acids and their derivatives such as HDL, LDL, triglycerides and etc. Over all prevention from risky factors such as poisons, pollutions, synthetic and industrial materials, chemical compounds and etc is the best way to avoid cancer (Greaves et al., 1993). Nowadays new diagnostic experiments are improved in order to find out the problems as soon as they occur in human body. It is advised to check up every two years for young people and every year for old ones.

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