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Frequency of ABO Blood Group and Decreased Level of Hemoglobin in Lung Cancer Patients

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Abstract

The present study was done in Cancer Hospital and Research Institute Gwalior (MP) to find out the frequency of ABO blood group and hemoglobin levels in lung cancer patients. ABO blood group is one of the main factor in patient's genetic makeup and found to be associated with many diseases. Lung cancer is one of the major cancer affecting a large population now a day throughout the world. The frequency of B blood group was found to be highest with percentile frequency of 0.38 followed by O i.e. 0.33 in lung cancer patients. The χ^2 value found to be 0.954 ($p = 0.328<0.05$). Low hemoglobin level (Anemia) was also found in cancer patients, Z test value 2.3324 ($p= 0.0198<0.05$) indicated the hemoglobin level was significantly lower in male patients than female patients. Z test value for the hemoglobin levels of smoker and non smoker lung cancer patients was found to be 3.1226 ($p =0.0018<0.001$) which showed significant lower level of hemoglobin in lung cancer patients with smoking habits than the non smoker lung cancer patients.

Keywords: ABO Blood group, Lung cancer, Population genetics, Frequency allele, Anemia.

Introduction

The ABO blood type, an easily accessible factor in patient's genetic makeup, has been associated with many diseases. Lung cancer was a rare disease at the beginning of the 20th century; it has risen with an increase in cigarette smoking, becoming the most common type of cancer globally [1]. Murray and colleagues reported that lung cancer ranks as the tenth cause of death worldwide in 1997 and has led to 1 million human deaths per year. It is predicted that it will rise to the fifth cause of death by 2020 [2]. Recently, lung cancer prevalence has reached to 12.8% of all cancer cases and is responsible for 17.8% of all cancer deaths [3].Anemia is defined as a hemoglobin level lower than 14 g/dl for men and 12 g/dl for women. It has

been subdivided into mild (10 g/dl—normal), moderate (8–10 g/dl), severe(6.5–8 g/dl) and life threatening (<6.5 g/dl or unstable patient) anemia [4].Anemia has reported in many cancer patients at the time of diagnosis and/or as the result of cancer therapy [5-7].Cancer itself can directly cause or exacerbate anemia either by suppressing hematopoiesis through bone marrow infiltration or production of cytokines that lead to iron sequestration. In addition, dugs used in chemotherapy cause the death of highly dividing normal RBCs along with cancerous cells that may lead to anemia in cancer patients [8, 9]. Cancer related anemia has involved in the deterioration of patient's quality of life through a higher rate of fatigue and impairment in cognitive function [10]. A study revealed that the patients with hemoglobin level more than 12 g/dL experienced significantly less fatigue, better physical well-being, better functional well-being, and generally higher quality of life in comparison to those whose hemoglobin was less than 12g/dL [11]. In a systemic, quantitative review, Caro *et al.*, (2001) found that the relative risk of death increased by 65% in anemic cancer patients. The relative risk of death due to anemia varied by type of cancer as follows: lung cancer (19%), prostate cancer (47%), lymphoma (67%), and head-and-neck carcinoma (75%) [12].

The present study was conducted to find the frequency of ABO blood group and hemoglobin levels in lung cancer patients.

Material and Methods

Blood samples of 100 lung cancer patients were collected to those who admitted in Cancer Hospital and Research Institute Gwalior (M.P.) from April 2013 to March 2014 and analyzed the ABO blood group and hemoglobin level. The blood group test was performed by using Anti-A, Anti- B, Anti-H per ABO blood grouping, briefly the samples were collected in normal saline solution washed and analyzed in 3-5% suspension of red cells in saline slide method was used [13].Hemoglobin (Hb) values are given in grams per liter $x10^2$ (g/dl).

Statistical analysis: Allele frequency for ABO blood group was calculated by Bernstein formula. Chi square test and Z test were also performed to find out the significant difference between variables by SPSS software.

Results

Among 100 lung cancer patients 79 were males and 21 were females, 58 patients belongs to rural area and 42 patients belongs to urban area, 79 patients were pure vegetarian and 21 were not pure vegetarian, 56 patients were having smoking habit and 44 patients were non smoker.

Table 1.1: Showing age group distribution of lung cancer patients:

Age group (Age in yrs)	No. of patients	Percentage (%)
Below 20	04	04%
21-40	09	09%
41-60	47	47%
61-80	39	39%
Above 80	01	01%

Total	100	100%

Results of ABO Blood group

The study on occurring frequency of ABO blood group in 100 lung cancer patients shows that the blood group B has the highest frequency percentile 0.38 followed by blood group O 0.33, blood group A 0.22 and blood group AB 0.07.

Table 1.2: Percentile frequency of ABO blood group

Blood group	No. of individuals	Male percentile frequency	Female percentile frequency	Total percentile frequency
A	22	0.16	0.06	0.22
B	38	0.28	0.10	0.38
AB	07	0.07	0.00	0.07
O	33	0.27	0.06	0.33
Total	100	0.78	0.22	1.00

The allele frequency was calculated by Bernstein method and it shows that blood group A has allele frequency (p_c) 0.158, B blood group (q_c) 0.259 and O blood group (r_c) 0.574. The expected frequency and expected number for the individuals of A blood group was calculated by (p_c^2) and $2(p_c r_c)$ because the likely genotypes of A blood group AA and AO and it was found 0.205 and expected number was 20.5. Since the likely genotypes of B blood group are BB and BO thus there expected frequency is calculated by (q_c^2) and $2(q_r)$ and was found 0.364 and expected number are 36.4. The AB blood group has genotype AB and its expected frequency was calculated by $2(p_c q_c)$ and was found 0.081 and expected number are 8.1. The O blood group has genotype OO and its expected frequency was calculated by (r_c^2) and was found 0.329 and expected numbers are 32.9.

Table 1.3: Calculation of chi square test for ABO blood group system:

Phenotypes	Observed numbers	Observed frequency	Expected frequency	Expected numbers
A	22	0.22	0.205	20.5
B	38	0.38	0.364	36.4
AB	07	0.07	0.081	8.1
O	33	0.33	0.329	32.9
Total	100			
Chi square value				0.954
P value				0.328

The Chi square test was performed on above data and the value of X^2 was found to be 0.954 and the p value was calculated at degree of freedom one was found to be 0.328 which is 0.50<p>0.30 shows goodness of fit of the sample.

Results of Hemoglobin levels

Lower hemoglobin levels or Anemia were also found in lung cancer patients (<14 for males and <12 for females) from the normal values in 80 lung cancer patients, in which 67 were male and 13 were females.

Table 1.4: Showing decreased levels of hemoglobin in male and female lung cancer patients:

Numbers of male patients	Number of female patients	Total	Z test value	P value
67	13	80	2.3324	0.0198

Z test was performed to find whether the difference in hemoglobin levels was significant or not in male and female patients groups. Z score was found 2.3324 and p value was 0.0198. The result is significant at $p<0.05$, so the hemoglobin levels were found to be significantly lower in male patients than female patients.

Table 1.5: Showing correlation between smoking habit of patients and decreased levels of hemoglobin:

Total no. of smokers with lung cancer	Total no. of non smokers with lung cancer	Smokers (lung cancer patients) with lower levels of hemoglobin	Non smokers (lung cancer patients) with lower levels of hemoglobin	Z value	P value
56	44	51	29	3.1226	0.0018

Z test was also performed to find whether the difference in hemoglobin levels were significant or not in lung cancer patients with smoking habits and lung cancer patients without smoking habits. Z score was found 3.1226 and p value was0.0018. The result is significant at $p<0.05$, so the hemoglobin levels were found to be significantly lower in lung cancer patients with smoking habits than lung cancer patients without smoking habits.

Table 1.6: Distribution of lung cancer patients in different sub groups of Anemia:

Type of Anemia	Hemoglobin range (gm/dl)	No. of Patients
Mild Anemia	10gm/dl - Normal	58
Moderate Anemia	8gm/dl – 10gm/dl	17
Severe Anemia	6.5gm/dl – 8gm/dl	02
Life threatening Anemia	< 6.5gm/dl	03
Total		80

Among 80 anemic patients 58 were found to has mild anemia, 17 patients has moderate anemia, 2 patients has severe anemia and 3 patients has life threatening anemia.

Discussion

From the above results we have found that the frequency of B blood group is maximum in lung cancer patients followed by blood group O, A and AB. The rate of anemia is high about (50%-60%) in patients with lymphomas, multiple myeloma, lung tumors, and gynecologic or genitourinary tumors, but the rate of anemia is comparatively low in patients with solid tumors is than that observed for hematological malignancies, incidence of mild-to-moderate anemia can be high [14-16]. Anemia was found to be most common in lung cancer patients (52%) [17]. Anemia related with chronic disease is also a very commonly present in cancer patients [14]. Anemia in cancer patients is generally due to abnormal production and utilization of erythropoietin which stimulates the production of red blood cells [18-19]. Abnormal iron metabolism also plays an important role in anemia of chronic diseases. Iron deficiency in tissue is characterized by low transferrin saturation and low levels of serum ferritin, in many chronic diseases including cancer low transferrin saturation and elevated serum ferritin is a characteristic of anemia in chronic disease [20].

In this study lower hemoglobin levels in male (< 14gm/dl) and female patients (< 12) were found in lung cancer patients which shows that anemia is common in lung cancer patients, which may be due to lower level of RBC'S count (red blood cells). In our study it has been found that among 80 anemic lung cancer patients most of the patients have mild anemia, few has moderate anemia and rare has severe and life threatening anemia. The hemoglobin levels in male patients were significantly lower than female patients. It has been also found that lung cancer patients with smoking habits has significantly lower levels of hemoglobin than lung cancer patients with no smoking habits, so we can assume that there might be some relation between lower hemoglobin levels and smoking habits in lung cancer patients.

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