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Association of Anemia with Blood Groups

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Abstract

Background: Blood is an unique connective tissue which confers identity to an individual with blood group and type. Blood group has clinical importance in transfusion medicine. One of the major health problems in the world is malnourishment, of which anemia contributes to a vast subset, especially in developing countries. Decreased hemoglobin levels in turn adversely affect functioning of other systems of the human body. Blood group association with diseases like gastric cancer, pernicious anemia are proven. Previously, some studies had varied results analysing association of anemia with different blood groups. So, the present study was done to throw light on Hb levels and blood groups. *Objective:* The objective of this study was to find out the distribution of blood groups, the variation of hemoglobin concentration of the subjects, if there is any association of low Hb levels and blood groups. *Methods:* First MBBS and BDS students of the academic year 2018–2019 who were admitted in Mamata Medical College were taken as subjects and their blood grouping was done using standard antisera method.The hemoglobin content of the subjects was estimated with the help of Sahli's hemoglobinometer. *Results:* The blood group distribution was O (44.87%), B (27.31%), A (23.85%), AB (3.90%). 12.72% males were anemic and 84.66% females were anemic. The distribution of anemia in blood groups was O with 7.31%, A with 4.87%, B of 4.39% and AB with 0.97%. The Chi-square value was 0.76 with p value of 0.85 which is insignificant. *Conclusion:* Anemia was found to be more in subjects with O blood group and less in case of persons belonging to AB group. The blood groups were seen to follow the Asiatic trend (O > B > A > AB). Females were anemic may be due to reduced red blood cell mass influenced by high estrogen levels.

Keywords: Anemia; ABO Blood group; Hemoglobin.

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Introduction

Anemia is a condition where there is a decrease in the oxygen carrying capacity of blood either due to reduced red blood cells or less than the normal quantity of haemoglobin in the blood.[1] The causes of anaemia is multifactorial and may result from blood loss, decreased red blood cell production or increased red blood cell breakdown.[2] Anaemia is a global public health problem affecting nearly a quarter of the world's population.[3] Although its effect is felt in both developing and developed countries, developing countries are the most affected.[4] As per the World Health Organization (WHO) database on anemia globally, anemia affects 1.62 billion people

(95%), which corresponds to 24.8% of the population. WHO also estimates that anemia contributes to about 20% of maternal and perinatal death in developing countries.[5] The impact of anaemia on maternal and child health is well recognised. Severe anaemia has been linked to increased risk of maternal and child mortality.[6,7,8] Anaemia has also been linked to impaired psychological and physical development, behaviour, and work performance of the population.[9] If it would be possible to determine whether any specific population is prone or resistant to anemia, it would rather be easy to suggest specific dietary advice to prevent the occurrence of anemia in such population. Disease like gastric cancer is associated with A blood group.[10,11] Blood group A persons suffer frequently with pernicious anemia[12] are few examples of association of blood group and common diseases. In a population group, so it is therefore imperative to have information on the distribution of these blood groups.[13]

Materials and Methods

The present cross sectional study was conducted in the Department of Physiology, Mamata Medical College, Khammam, between August 2018 and January 2019.

Description of Participants

Students pursuing first year M.B.B.S and first year B.D.S in the academic year 2018–2019 were selected as subjects. Nature of the study was explained and written informed consent was obtained from them. The study was approved by the Ethical and Research Committee of the institution. All the medical and dental students do their blood grouping, hemoglobin estimation during their 1st year of study as a part of their curriculum in hematology practical. The available data reports of ABO blood group and Rh blood type of 205 students was analyzed.

Inclusion Criteria: Age 17–21 years

Exclusion Criteria: Known hemolytic disorders, hereditary anemia, anemic subjects under treatment

Methodology

Blood grouping and typing

The blood grouping and typing was done by standard antisera slide agglutination method. A sterile finger prick was given to the middle or ring finger of the students and few drops of blood were added into a test tube with 0.9% Normal saline. The respective antisera were taken on a slide and separately mixed with the saline suspension of blood and checked for agglutination, presence or absence of clumping determine the blood group. For confirmation, agglutination was taken on a glasss slide and focused by using low-power objective of a compound microscope.[14]

Hemoglobin Estimation

Hemoglobin estimation was done using Sahli's hemoglobinometer based on the principle of formation of acid hematin and colorimetric matching with standard comparators of the apparatus. Three readings were taken, the first reading corresponded to the color of the fluid when it was slightly darker than the comparator. The second reading was noted when the fluid color matched exactly to the comparator. The third recording was that of the fluid color slightly lighter than the standard color. All the three readings were noted in the g/dL taking the scale at lower meniscus values. The average of the three readings was taken as the final hemoglobin value in gm/dL.[14] Anaemia was considered as Hb ≤ 12 g/dL for females and Hb ≤ 13 g/dL for males.

Statastical Analysis

As per the standard protocol, the result was expressed as percentage which is considered as frequency distribution of each ABO blood group and Rh factor. To establish the relationship in between the blood group and anemia, the frequency distribution (observed frequency) of blood group among the entire anemic population (N = 134) was compared with those of general non anemic population (N = 61) by Chi Square test (Mahajon, 2006).[15]

Results

The subjects in this study were 205, out of which were 55 males and 155 females. Table 1 shows the prevalence of different blood groups in males in decreasing frequency (O > A > B > AB). The prevalence in females was observed with a slight difference (O > B > A > AB). O blood group was the most prevalent group in the subjects (44.87%). Table 2 shows 71 subjects were having normal hemoglobin concentration and 134 were found to be anemic. 7 (12.72%) males were anemic

Table 1: Gender wise blood group distribution

	Blood Group			
	A	**AB**	**B**	**O**
Male	14(6.82%)	4(1.95%)	12(5.85%)	25(12.19%)
Female	35(17.03%)	4(1.95%)	44(21.46)	67(32.68%)

and 127 (84.6%) females had low Hb content. The distribution of anemia in blood groups as depicted in Table 3 was O group with 7.31%, A group with 4.87%, B group of 4.39% and AB group with 0.97%. The Chi-square value was 0.76 with p value of 0.85 which is insignificant (>0.05) in all blood groups, showing no association between anemia and blood groups.

Table 2: Distribution Bloodgroups with Rh Typing

	A^+	A^-	AB^+	AB^-	B^+	B^-	O^+	O^-
Male	13(23.63%)	1(1.81)	2(3.63)	2(3.63%)	12(21.81)	0(0%)	23(41.81)	2(3.63%)
Female	34(22.66%)	1(0.66)	3(2%)	1(0.66%)	43(28.66)	1(0.66%)	60(40%)	7(4.66%)

Table 3: Genderwise distribution of hemoglobin levels

	Distribution of HB levels among students (n=205)	
	Normal	**Below normal**
Male	48(87.27%)	7(12.72%)
Female	23(15.33%)	127(84.66%)

Table 4: Assosciaton of blood groups and hemoglobin levels

Blood Group	Total	Normal (%)	Anemic (%)
A	49	39(19.02)	10(4.87)
AB	8	6(2.92)	2(0.97)
B	56	47(22.92)	9(4.39)
O	92	77(37.56)	15(7.31)

The chi-square statistic is 0.7664. The p-value is 0.857497. The result is not significant at $p < .05$.

Discussion

Anemia is a global problem and at its worst in developing countries. Anemia has been effecting various organ systems in the human body, right from childhood to oldage. It has been the cause for poor maternal health, its allied complications like infections, PPH, perinatal death, ill neonates, poor development of physical and mental health of adolescents and so on the vicious cycle goes on. Low levels of hemoglobin is associated with poor performance of students in academics.[16] Blood grouping and typing is a frequently done investigation prior to blood donation, documenting on identity cards, useful in case of any emergency blood transfusion. Hemoglobin estimation is also a common test done in the outpatient departments in nearly all the specialities of medicine. Both the tests are done routinely as practicals under M.B.B.S,[17] B.D.S, MLT curriculum. On the other hand, blood group is one of the important and comparatively known parameter to the large number of present population which exhibits a strong correlation with some common diseases like cardiovascular diseases (WHO, 1993), gastric cancer[10] and even HIV infection. If such relation is found existing between anemia and blood group, then it will become very easy to predict the type of population which is more prone or resistant to anemia and thus help us to recommend such population for taking preventive measure so that ill effects of low Hb levels can be eradicated in such groups.

Our study showed same prevalence of ABO blood group as in Asiatic trend. Many researchers have reported that the prevalence of ABO blood groups were O > B > A > AB.[18–22]

Basak Asim Kuma and Maji Kaushik[23] in their study stated that A blood group is more prone for anemia and O group is reisitant for the same. This observation did not coincide with the outcome of the present study. According to Karl Landsteiner and Weiner, if the specific agglutiongen is present on the RBC surface, and the corresponding agglutinins should be absent in the plasma.[16] As per this law, A blood group has agglutinogen-alpha on the RBC surface and agglutinin–beta in its plasma, both alpha and beta aagglutinins are present in the plasma of blood group O. The individuals with blood group antigen alpha and beta are comparatively more prone to be anemic, due to increased risk of hemolysis, whereas the individuals devoid of these antigens are resistant to anemia. Study done by Tebit, Tayong[24] stated that AB group was prone to be anemic, which contradicts the result of this study. O blood group was found to have more subjects with low Hb level which is similar to the findings of Mukherjee DP, Das MK.[25] Hira Buran *et al*. stated that there was no significant association between the type of blood group and susceptibility to anemia,[26] which is in parallel to the observation of this study.

Conclusion

O blood group was the predominant subset with low Hb levels, there was no significant association of anemia with any blood group. The blood groups seen in decreasing frequency in the study was O > B > A > AB. Gender wise females were prone for anemia.

List of Abbreviations Used

Hb	:	Hemoglobin
Rh	:	Rhesus
WHO	:	World Health Organisation
M.B.B.S.	:	Batchelor of Medicine, Batchelor of Surgery
B.D.S.	:	Batchelor of Dental Surgery
MLT	:	Medical Laboratory Technician
HIV	:	Human Immuno Deficiency Virus
PPH	:	Post Partum Hemmorhage

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