

Association Between Blood Groups and Blood Hemoglobin Levels in Rural Population of Bihar Region

Rita Kumari

Associate Professor & HOD, Department of Physiology, Nalanda Medical College, Patna, Bihar, India

Received: 10-08-2021 / Revised: 22-09-2021 / Accepted: 29-10-2021

Corresponding author: Dr. Rita Kumari

Conflict of interest: Nil

Abstract

Aim: Study of association between blood groups and blood hemoglobin levels in rural Population of Bihar region.

Methods: The present Prospective study was conducted in the Department of Physiology, Nalanda Medical College, Patna, Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee. 100 adults (males and females) who are in the age group of 18-32 years were included in this study. Blood sample is taken using finger prick, under aseptic conditions and blood group is determined using glass slide method using antisera A, B and D. Hemoglobin concentration is estimated using Sahli's method.

Results: In our study, adults with hemoglobin concentration less than 10g/dl were taken as anemic. Total 29 adults are anemic, while remaining 71 adults are non anaemic. 40 adults are females out of which 60 are anemic whereas 60 adults are males where only 10 males were found to be anemic. 28 adults with Hb less than 10g/dl were Rh positive and 1 adults Rh negative. 66 adults and 3 adults were Rh positive and Rh negative respectively with Hb more than 10g/dl. Also 27 adults are blood group A, 5 with blood group AB, 35 with blood group B and O blood group adults are 33. Among the A blood group, 4 adults were anemic, among blood group B, 14 were anemic, among blood group AB, 2 were anemic and 9 adults with O blood group were anemic. In our study we found that adults with blood group B (14%) are more prone for anemia, followed by O (9%), AB (2%) and blood group A (4%). Blood group A almost resistant to anemia.

Conclusion: Individuals with blood group B are more prone to anaemia followed by blood group O, AB and least is with blood group A.

Keywords: hemoglobin, anaemia, blood group

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Blood is a specialized connective tissue with complete and unchangeable identity. It provides one of the means of connection between the cells of different parts of the body and external environment.[1] In modern medicine blood transfusion is an

important measure for replacing blood loss[2] At least 30 commonly occurring antigens and hundreds of other rare antigen have been found in human blood cells, especially on the surfaces of the cell membranes. Most of the antigens are weak

and therefore are of importance principally for studying the inheritance of genes to establish parentage. Two particular types of antigens are much more likely than the others to cause blood transfusion reactions. They are the A B O system of antigens and the Rh system.[3] ABO and Rh are recognized as the major clinically significant blood group antigens. The rhesus blood group system was the fourth system to be discovered.[1] The ABO blood group individuals are divided into four major blood groups, namely, A, B, AB and O, according to the presence of antigens and agglutinins. Blood group A blood has type A antigens, blood group B has type B antigens and blood group O has neither A nor B antigens. The Rhesus antigen (name because a related antigen was first discovered in Rhesus monkeys), is found in the red blood cells of approximately 85%-90% of the people. This is the second most important blood group system due to its immunogenicity in Rh negative individuals in blood transfusion or pregnancy. Rh positive individuals have RhD antigen on the surface of their red blood cells and Rh negative individuals do not have this antigen. Blood group antigens are not only important in relation to blood transfusion and organ transplantation, but also have some association with diseases like duodenal ulcer, diabetes mellitus, urinary tract infection and Rh incompatibility of the newborn.[1] 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.[4,5] Anaemia can be defined by a condition in which the total haemoglobin (Hb) level or number of red blood cells (RBCs) is poorly lowered. The World Health Organisation (WHO) defines anaemia as Hb < 130 g/L in men older than 15 years, 110 g/L in pregnant women, and < 120 g/L in non-pregnant women older than age 15[6,7] Anemia is defined as a clinical condition which is characterized by

reduction in hemoglobin concentration of the blood below the normal for the age.[2] It is a global problem, mainly affecting poor people in developing countries[2,3] Anemia during adolescence severely impairs the physical and mental development; weakens behavioral & cognitive development; reduces physical fitness; decreases the work performance and even contributes to the adverse pregnancy outcome.[1] Though, the oral iron supplements are given commonly to correct anemia, but should be used only when dietary measures have failed. Moreover, iron supplement can correct anemia which is due to iron deficiency[4] Besides this, oral iron supplements can cause gastrointestinal problems like nausea, vomiting, diarrhea and constipation and can even aggravate pre-existing ulcers and ulcerative colitis. Long term iron supplements also can cause heart disease. Anaemia even can have a negative impact on physical performance, due to reduced oxygen transport the reduced cellular oxidative capacity[6,8]

Material and methods

The present Prospective study was conducted in the Department of Physiology, Nalanda Medical College, Patna, Bihar, India for 1 year. after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

100 adults (males and females) who are in the age group of 18-32 years were included in this study. Blood sample is taken using finger prick, under aseptic conditions and blood group is determined using glass slide method using anti-sera A, B and D. Hemoglobin concentration is estimated using Sahli's method. The brief of the study and procedure is given to the subjects and informed consent taken.

Results

In our study, adults with hemoglobin concentration less than 10g/dl were taken as anemic. Total 29 adults are anemic, while

remaining 71 adults are non anaemic. 40 adults are females out of which 60 are anemic whereas 60 adults are males where only 10 males were found to be anemic. 28 adults with Hb less than 10g/dl were Rh positive and 1 adults Rh negative. 66 adults and 3 adults were Rh positive and Rh negative respectively with Hb more than 10g/dl. Also 27 adults are blood group A, 5 with blood group AB, 35 with blood group

B and O blood group adults are 33. Among the A blood group, 4 adults were anemic, among blood group B, 14 were anemic, among blood group AB, 2 were anemic and 9 adults with O blood group were anemic. In our study we found that adults with blood group B (14%) are more prone for anemia, followed by O (9%), AB (2%) and blood group A (4%). Blood group A almost resistant to anemia.

Table 1: Distribution of anaemic and non-anaemic adults

Hb	Frequency	Percentage
<10	29	29
>=10	71	71
Total	100	100

Table 2: Anaemic status in males and females

Sex	Hb		Total
	<10	>=10	
Female	19	21	40
Male	10	50	60
Total	29	71	100

$$\chi^2 = 50.70, p < 0.0001$$

Table 3: Different blood group status in anaemic and non-anaemic adults

Blood group	Hb		Total
	<10	>=10	
A +ve	4	21	25
A -ve	0	2	2
AB +ve	1	3	4
AB -ve	1	0	1
B -ve	0	1	1
B +ve	14	20	34
O +ve	9	24	33
Total	29	71	100

$$\chi^2 = 6.16, p = 0.14$$

Discussion

Anemia is a global problem and at its worst in developing countries. Though oral supplementation of iron and vitamin B12 and folic acid are most commonly used as a therapeutic measure to correct anemia; it is suggested that the oral supplementation of iron is not the best way to correct anemia (especially which are not due to iron deficiency) especially due to its adverse effect on some other body functions for

which the patients sufferings becomes worst. Under this situation, it is far better to take the preventive measure to combat anemia by taking iron or vitamin rich diet, especially to those who are more prone to anemia; though the type of such population is not known to us. 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, gastric cancer and even HIV infection[9,10] In our study, the distribution of blood group B was the highest with a percentage frequency of 35%, followed by blood group O and A with a percentage frequency of 33 and 27% respectively and the least percentage frequency is that of blood group AB which is 5%. The prevalence of anaemia in our study was found in blood group B, followed by O, AB and then A. The same trend of prevalence of blood groups (B>O>A>AB) was observed and reported by study conducted by Kaur M[1] In many other studies, blood group O has been found to be the most common blood group. The frequency of Rh+ve was about 96%, while 4% were Rh-ve in our study. Similar patterns of distribution were also observed in other studies. Thus, the frequencies of ABO and rhesus blood groups vary from one population to another. In our study we found that adults with blood group B (14%) are more prone for anemia, followed by O (9%), AB (2%) and blood group A (4%). Blood group A almost resistant to anemia. Similar findings were seen in the study conducted by Basak Asim Kumar,[4] in which individuals having blood group B, A or AB were prone to anemia compared to blood group O but was statistically significant. On the other hand, there was no such relationship between Rh factor and the occurrence of anemia between the above mentioned populations. Anemia during adolescence severely impairs the physical and mental development; weakens behavioral and cognitive development; reduces physical fitness; decreases the work performance and even contributes to the adverse pregnancy outcome Mild anemia can adversely affect the productivity and is also known to reduce the immune-competence. The average prevalence of anemia is 25-80% seen in several studies across the Indian subcontinent in a study conducted by ICMR in sixteen districts in eleven different states reporting a prevalence rate of anemia 90.1% among the adolescent girls of 11-18

years age groups. In their study, 35% anemia was seen in the 300 adults studied. In further evaluating gender wise it was found that anemia was significantly more in the girls (66.67%) compared to the boys (33.33%) with a 'p' value of 0.0001. The similar higher prevalence of anemia was found in the rural girls (98%) and boys (56%) of Punjab. This study reveals that there is a relationship between blood group and anemia, though not statistically significant which could be due to small sample size. Similar finding was found in our study where girls are more prone to anaemia. The individuals with blood group antigen alpha and beta are comparatively more prone to be anemia, whereas the individuals devoid of these anti gens are resistant to anemia. So, the regular intake of iron and vitamin rich diet in individuals having blood groups A, B, and AB can prevent the occurrence of anemia.

Conclusion

The present study concluded that individuals with blood group B are more prone to anaemia followed by blood group O, AB and least is with blood group A. Based on their blood groups, we can advice regular intake of diet rich in iron and vitamins or also their supplements to the individual who are more susceptible to anaemia.

Reference

1. Kaur M. Relationship and Distribution of ABO, Rh Blood Groups and Hemoglobin Concentration among the Adolescents J Phys Pharm Adv 2015, 5 (9): 703-712 .
2. Reshmarani, Shilpa N., Subhash Chimkode A Study of Correlation Between Blood Groups and Anemia in Young Adults, International Journal of Physiology, 2019; 7(4): 199-202.
3. Guyton and Hall, Textbook of Medical Physiology; Second South Asia Edition July 2016;201-202.
4. BasakAsim Kumar and Maji Kaushik: Blood group and anemia:Exploring a new relationship, Journal of Public

- Health and Epidemiology 2013;5(1):43-45.
5. Harvey P (2004). A strategic approach to anemia control, MOST, The USAID micronutrients program, Arlington, Virginia. <http://health.nytimes.com/health/guides/disease/anemia/treatment.html> retrieved on 12.02.12.
 6. Salma AlDallal, Iron Deficiency Anemia: A Short Review, Journal of Cancer Research and ImmunoOncology, 2016; 2(1):3-6.
 7. Goddard AF, James MW, McIntyre AS, Scott BB. Guidelines for the management of iron deficiency anaemia. Gut 2011;60: 1309-1316.
 8. Zhang AS, Enns CA. Molecular mechanisms of normal iron homeostasis. Hematology. Am Soc Hematol Educ Program 2009;1: 207-214.
 9. Jennings D, Balme RH, Richardson JE. Carcinoma of stomach in relation to ABO blood groups. Lancet 1956; 2:11.
 10. Abdulazeeze AA, Alo EB, Rebecca SN, Carriage rate of human immunodeficiency virus infection among different ABO and Rhesus blood groups in Adamawa State Nigeria. Biomed. Res.2008; 19:41-44.