

# An Observational Study to Assess the Association between Blood Groups and Blood Hemoglobin Levels in People Residing in the Rural Area of Bihar

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## Abstract

**Aim:** The aim of the present study was to assess the association between blood groups and blood hemoglobin levels in people residing in the rural area of Bihar.

**Methods:** The present study was conducted at Department of Physiology, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar 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.

**Results:** In our study, adults with hemoglobin concentration less than 10g/dl were taken as anemic. Total 30 adults are anemic, while remaining 70 adults are non anaemic. 45 adults are females out of which 55 are anemic whereas 60 adults are males where only 10 males were found to be anemic. 27 adults are blood group A, 4 with blood group AB, 35 with blood group B and O blood group adults are 34. Among the A blood group, 4 adults were anemic, among blood group B, 10 were anemic, among blood group AB, 2 were anemic and 14 adults with O blood group were anemic.

**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.

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## Introduction

There are 33 blood groups recognized by the International Society of Blood Transfusion. [1] The major blood groups are A, B, AB, and O with either Rh positive or negative. These blood groups of individuals are determined genetically by coding for specific antigens on the surface of the red cell membrane. There are many studies reported the association of ABO blood groups with disease etiology. The risk of ovarian cancer is 40–60% higher in females with non-O blood

groups. [2] It is a well-known fact that A blood group is associated with increased risk of gastric cancer. [3]

Likewise, blood hemoglobin values also differ among individuals. These variations are due to age, sex, race, occupation, socioeconomic status, and various diseased conditions. Women have 12% less Hb levels when compared with age-matched men. [4] Genes encoding RBC enzymes and membranes can also cause genetic

variations in hemoglobin concentrations. [5] However, there are very few studies which have reported the difference in blood hemoglobin levels among individuals of different blood groups. There are few older studies which have reported the higher incidence of hemolytic anemia in certain blood groups. Pernicious anemia is commoner in A blood groups males and females. [6] In a study done among the Bengalee families in Calcutta, low hemoglobin levels were observed in A1 and O blood groups. [7] B blood group individuals have higher mean hemoglobin levels than other blood groups among Dhimals at Naxalbari of the Darjeeling district of West Bengal, India. [8]

Anemia is defined as a clinical condition which is characterized by reduction in hemoglobin concentration of the blood below the normal for the age. [9] It is a global problem, mainly affecting poor people in developing countries. [10,11] 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. [9] 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. [12] 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. [13,14]

The aim of the present study was to assess the association between blood groups and blood hemoglobin levels in rural Population of Bihar region.

## Methods

The present study was conducted at Department of physiology, Netaji Subhas medical College and Hospital, Bihta, Patna, Bihar 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 was collected by finger prick method. The procedure was done under strict aseptic precautions. Blood group of the individuals was checked by slide method using antisera A, B, and D (Spanclone, Arkray). Few drops of blood were mixed with NaCl in a test tube. A drop of each antisera A, B, and D was added in three slides and slides were named as A, B, and D. Then, a drop of blood admixed with NaCl was added to all three slides and mixed well with three different wooden sticks. A control slide with a drop of blood with NaCl is also kept to rule out any self-agglutination. The slides were kept covered with Petri dish to prevent any evaporation of antisera for 10 min. After 10 min, the slides were observed for agglutination and the blood groups were determined accordingly. Blood hemoglobin levels were estimated using the instrument hemo control (EKF diagnostics). The finger pricked blood was collected into a hemoglobin microcuvette and this was fed into hemo control. The hemoglobin levels were displayed digitally. The values were recorded.

Data were transferred to Microsoft Excel sheet. The blood hemoglobin values of different blood groups were tabulated. Statistical analysis was done using non-parametric tests with SPSS software version 23. Box plots and graphs were done for comparison using SPSS version 23, Igor Pro software version 6, and Microsoft Excel 2007. P values were checked for any statistically significant differences in the hemoglobin values.

## Results

**Table 1: Distribution of anaemic and non-anaemic adults**

Hb	Frequency	Percentage
<10	30	30
>10	70	70
Total	100	100

In our study, adults with hemoglobin concentration less than 10g/dl were taken as anemic. Total 30 adults are anemic, while remaining 70 adults are non anaemic.

**Table 2: Anaemic status in males and females**

Gender	Hb		Total
	<10	>10	
Female	20	25	45
Male	10	45	55
Total	30	70	100

45 adults are females out of which 55 are anemic whereas 60 adults are males where only 10 males were found to be anemic.

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

Gender	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	10	24	34
O +ve	8	15	23
O -ve	6	5	11
Total	30	70	100

27 adults are blood group A, 4 with blood group AB, 35 with blood group B and O blood group adults are 34. Among the A blood group, 4 adults were anemic, among blood group B, 10 were anemic, among blood group AB, 2 were anemic and 14 adults with O blood group were anemic.

### Discussion

According to the World Health Organization criteria, anemia is defined as blood hemoglobin concentration <13 g/dl or hematocrit <39% in adult males; hemoglobin <12g/dl or hematocrit <37% in adult females. Anemia can be caused by many factors; nutritional deficiency is the commonest among all. Though it is

prevalent in all the countries but it is a major concern in developing countries like India as the commonest cause is nutritional deficiency which is a treatable cause. Children < 5 years and pregnant females are the most affected groups suffering from nutritional deficiency anemia and their complications. [15]

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. [16,17] 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 34% 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. [9]

There were very few studies done in limited population which have compared the values of hemoglobin in different ABO blood groups. Agrawal et al., in 2014, reported that the most common blood group in our country was O (37.12%), followed by B (32.26%), then A (22.28%) and AB (7.74%) being the least prevalent. [18] A study done by Hoque et al. showed lower hemoglobin, serum iron, serum ferritin, and percentage transferrin saturation levels in subjects with O blood group though they did not find any significant difference among the blood groups, but in our study, the mean hemoglobin values were higher in O group though there were no significant differences. Blood group A had the highest TIBC. [19]

A study done in the suburb of Calcutta region showed lower levels of hemoglobin in A1 and O blood groups. There could be regional, racial, and regional differences in the hemoglobin values in the individuals and this could be the reason why we have different results of mean hemoglobin values in different blood groups in our selected population. Fluctuations in Hb levels and its association with comorbid conditions overtime are also observed with different type of blood groups. [20] Similar to our study, Mahapatra et al. also

have found comparable differences in blood hemoglobin values in different types of ABO blood groups. [21,22]

### 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 advise regular intake of diet rich in iron and vitamins or also their supplements to the individual who are more susceptible to anaemia.

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