



A Study of ABO And Rh (D) Blood Groups And Association With Degree of Anemia In Pregnant Women Attending A Tertiary Care Hospital

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: Anemia is a serious health concern in females during pregnancy, can be caused due to various reasons includes nutritional deficiencies, chronic illnesses, thalassemia and many more.

Methods: Study was performed over a period of 1 year (December 2021- November 2022), on EDTA blood samples received in a tertiary care hospital. The sample were processed on Sysmex XN-1000 for the evaluation of anemia and ORTHO VISION™ ANALYZER were used for detection of blood group.

Results: Study was conducted on total 306 pregnant women. The anemia cases based on severity were as follows: severe (2), moderate (26), mild (35) and 243 non anemic cases. The frequency of blood group were as follow, O blood group followed by B, A and AB group. The association between hemoglobin and the ABO blood group revealed that AB blood group were normal and severely anemic; while those with the O blood group were mildly anemic and B was moderately anemic. The most Prevalent of Rh(D) positive cases were severe and mild anemia. The association between Rh(D) negative and haemoglobin were as follow, total 11 Rh(D) negative cases of which 1 had moderate and 1 presented with mild anaemia, and the rest other 9 Rh(D) negative cases had normal haemoglobin.

Conclusions: Pregnant women should be particularly concerned about anemia since it can affect the outcome of pregnancy. In the current study concludes that O positive cases were more prevalent and most of them were non anemic. Only AB blood group found to have severe anemia.

Keywords: Anemia, ABO Blood group system, Pregnancy

Introduction

The blood group was introduced by Landsteiner in 1900. Presently more than 400 red blood cell antigens were identified from more than 20 blood group systems; only a few of them were clinically important and were inherited in a mendelian dominant fashion. ABO system and the Rh blood group system were the two blood group systems of importance. The ABO

blood groups were regulated by the presence or absence of antigen A & antigen B on the surface of red blood cells. According to this, human blood is classified into four groups A, B, AB, & O.[1]

The Rhesus antigen is found in the red blood cells. This is the second most important blood group

system due to its immunogenicity in Rh-negative individuals in blood transfusion or during 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 were not only important in blood transfusion and organ transplantation, but it also plays a major role in pregnancy and postpartum blood transfusion. Blood group has an association with diseases like duodenal ulcer, diabetes mellitus, urinary tract infection and Rh incompatibility of new born.[2]

Hemoglobin (Hb) is a protein found in red blood cells that carries oxygen in the body and gives blood its red color. Hemoglobin levels vary from person to person, Men usually have higher levels than Women; pregnant women were recommended to have a hemoglobin level of 11-17g/dl.[3]

Anemia is the most common hematological disorder occurring during pregnancy. In pregnancy, there is an increase in plasma volume, resulting in hemoglobin dilution. A hemoglobin level in pregnancy lesser than 11g/dl represent anemia of pregnancy, and symptoms of anemia include feeling increasingly tired, fatigue, shortness of breath with activity or at rest, a rapid heart rate, and swelling of the legs. So anemia is the major health concern in pregnancy; however, it is preventable through optimal diet and nutrition.[4]

Materials And Methods

The study was conducted on first trimester pregnant women attending a tertiary care Hospital. Specimens received in the Hospital Central Laboratory, were analysed for anemia and blood grouping.

Sample Size: 306 specimen.

Inclusion Criteria:

First trimester pregnant women whose blood sample was tested for ABO & Rh (D) type blood group and hemoglobin level.

Exclusion Criteria:

First trimester pregnant women with incomplete data of both parameters.

After acquiring the institutional ethical clearance, the relevant hematological details were collected and analysed.

After taking consent, the investigations were performed as per the clinician's request, those

relevant lab reports will be retrieved from the back bone which has stored in the electronic form in the archives of central laboratory.

For the evaluation of anemia, 3mL of blood sample was collected in BD Vacutainer® EDTA tubes and the test was performed on Sysmex XN-1000 machine and results were stored in the electronic form.

For the evaluation of blood group, Blood sample was collected in BD Vacutainer® EDTA tubes and run on ORTHO VISION™ ANALYZER. Forward and reverse grouping can be obtained, for reverse blood grouping, plasma was obtained by centrifuging the sample at 3000 rpm for 5 min at room temperature, forward grouping was obtained by the red cells.

The tests were performed at Department of central laboratory (NABL Accredited Laboratory) and results were stored in the electronic form.

Statistical Analysis:

The data was entered into excel sheet and analysed using social science version 27 statistical program (SPSS Inc, Chicago).

Frequencies and percentages of all the variables were computed. The data thus analysed, were correlated for relevant findings. Association and significance of anemia and blood grouping were determined using chi-square test. The p value of $P < 0.05$ with chi square test was considered as significant.

The p value of the Chi Squared test was 0.141 the association between blood type and Hb level was not significant.

Results

The study was conducted in a Tertiary care Hospital over a period of 1 year. A total 306 cases of pregnant women were included in this study. The age range categorized as follows 18-24, 25-30, 31-35 and 36-40 years. Most of the cases fall within the 18-25 age group (43.1%) (*Figure :1*).

The anemia cases were graded based on severity and there distribution were as follows: severe (2), moderate (26), mild (35) and 243 non anemic cases (*Figure :2*).

The prevalence of ABO blood group was as follows: the O blood group is most common 111(36.3%), followed by B 88(28.8%), A 85(27.7%),

AB22(7.2%). The RH (D) cases in the study revealed as , 96.5% (295) of Rh(D) positive and 3.5% (11) had Rh(D) negative .

There were 85 A blood group subtypes among which Rh(D) positive (80cases) were common as compared to Rh(D) negative (5cases). B blood group was found in 88 cases of which 84 were Rh(D) positive and 4 were Rh(D) negative. 22 cases of AB blood group with Rh(D) positive (100%). O blood group subtype was 111; among that 109(98.2%) were Rh(D) positive and 2 (3.5%) Rh(D) negative

Association of ABO blood group and haemoglobin levels data was categorized by various blood group types and the presence or absence of anemia. The findings are as follows: 85 cases had A blood group of which 5.9 % had moderate anemia, 12.9% mild anemia and 81.2% had normal hemoglobin levels. 88 cases had B blood group, 8.0% mild anemia, 13.6% moderate anemia and 78.4% had normal hemoglobin levels. 22 individuals had AB blood group of which 4.5% had severe anemia, 9.1% mild anemia and 86.4% had normal hemoglobin levels.

Statistical analysis was performed. Chi-square test was used to find the association between blood group and anemia. P value was 0.141, which was considered as statistically not significant (Table 1).

The association of Rh(D) and hemoglobin shows that 96.4%(295) Rh positive and 3.6%(11) Rh(D) negative. The p value of the Chi Squared test is 0.986, the significant association between Rh(D) and Hb level is not evident (Table 2).

Discussion

Blood is a unique component with an unalterable and complete identity. ABO and Rh were acknowledged as the two most clinically significant blood group antigens, and they were also known to differ from community to population. Nearly 400 blood grouping antigens have been reported. In order to better understand their frequency and hemoglobin content, our study intended to look at both[13].

In rural places where females were food deficient, anemia is a serious problem during pregnancy. Anemia can be caused by a variety of things, including nutritional deficiencies, chronic illnesses, thalassemia, neoplasia, and many more. Hemoglobin levels and blood types have been linked in numerous

researches in the past. In this study, we sought to determine the relationship between blood types and hemoglobin levels in pregnant women attending a tertiary care Hospital[12].

In this study, performed on 306 pregnant women who visited the tertiary care facility, we evaluated hemoglobin levels to know the degree of anemia as well as to know the different types of blood groups. Alemu M et al[3], conducted a study between July 2009 and July 2014, on 5987 pregnant women with all the trimester visited the clinic. Nwabuko OC et al[5], shows during the course of the investigation, 52 pregnant ladies were seen, second trimesters on average were used for booking. Sonda M et al[7], indicates 364 pregnant women were enrolled in this study with exceeding 28 weeks.

In our study the age groups were 18–24 year, 25–30 year, 31–35 year, and 36–40 year. In this study, pregnant women between the ages of 25 to 30 year make up the biggest percentage of participants 132 (43.1%) followed by those between the ages of 18 and 24 year (28.8%), 31 to 35 year (21.9%), and 36 to 40 year (6.2%) . Alemu M et al[3], conducted a study on pregnant ladies who underwent screening from the age group of 17 to 40 years which was found to be similar to our study. Sonda M et al[7], had enrolled pregnant women in their study, with maternal ages ranging from 20 to 35 years been comparable to our research. Reshmarani et al[2], conducted a study with 198 MBBS students (both genders) of Bidar Institute of Medical Sciences between the ages of 18 and 25 years which was relevant to our study. Kumar A et al[12], this study had 200 students in total. Between the ages of 16 and 25 years, there were 120 females and 80 males in this group. Sah JP et al[13], done a research with 259 school students aged 8-18years, Kumar BA et al [11], carried out a study on 276 anemic patient visited the B. C Roy Hospital in Haldia.

In our study, pregnant women with hemoglobin concentrations below 7g/dl were classified as having severe anemia, 7g/dl to 9.9g/dl was considered as moderate anemia, 10g/dl to 11 g/dl was considered as mild anemia, and >11g/dl was considered as normal . In the 306 cases, there were, 2 (0.7%) who were severely anemic, 26 (8.5%) who were moderately anemic, 35 (11.4%) were mildly anemic and 243 (79.4%) females who were not anemic . In Ethiopia

Alemu M et al[3], shows the average hemoglobin threshold of expectant women was analysed, 7.3% (436/5987) of the women had moderate anemia, 10.3% (615/5987) had mild anemia, and severe anemia was not observed. In Akter k et al[8], study discovered pregnant women's hemoglobin levels were Severe anemia is reported in 1.1% of people, moderate anemia in 14.4%, mild anemia in 55.7%, and severe anemia in 28.8% of people. In BidarKarnataka Reshmarani et al[2], analysis on Students who were considered as anemic in their study, if their hemoglobin concentration has less than 10 g/dl, 58 were anemic students and remaining 140 children were not anemic. Kumar A et al[12], shows female students have low levels of hemoglobin, while 53.5% of females have normal levels. 2.5% of male students have low hemoglobin levels, compared to a total of 37.5% who have normal hemoglobin levels.

In our study the frequency of blood group is O blood group, which is most prevalent among the 306 pregnant women 111 (36.3%), followed by B 88 (28.8%), A with 85 (27.7%), and AB 22 (7.2%). In Ramalingam L et al[10], research shows analysis of the entire population was conducted. The blood group B+ve were the most prevalent, followed by O+ve. O-ve had the lowest prevalence of any blood type (approximately 0.4%), and there were no AB-ve blood group participants in their study, so this study is inconsistent with our study. Sah JP et al[13], shows that the blood group O has the highest percentage of students (34.8%), followed by A (34.3%) and B (27.0%), respectively. Only 3.9% of students have blood type AB, which was found to be conflict to our study. Alemu M et al[3], found Blood group O was discovered to be the most prevalent, accounting for 41.5% (2482/5987), followed by blood groups A 28% (1674/5987), B 25% (1501/5987), and AB 5.5%; 330/5987) it is contradictory to our study.

From 306 instances, 96.5% (295) of this study's patients were Rh(D) positive, and 3.5% (11) were Rh(D) negative. 85 A blood types exist, 80 (94.2%) of which were Rh(D) positive, while 5 (5.8%) were Rh(D) negative. There were 88 people in the B blood type, 84 (95.5%) of them were Rh(D) positive, and 4 (4.5%) were Rh(D) negative. 22 AB blood groups were 100% Rh(D) positive. In the group of 111 O blood donors, 109 (98.1%) were Rh(D) positive and 2 (3.5%) were Rh(D) negative (Figure :3). Alemu M et al[3], shows (5458/5987) 91.2% of the women

tested positive for the rhesus D antigen, (529/5987) 8.8%, who tested negative. Sah JP et al[13], shows 0.6% of female students were Rh negative, compared to 51.8% of female students who were Rh positive. Rh positivity affects 46.8% of male students, compared to 0.8% of Rh negative students. Reshmarani et al[2], in their investigation, the prevalence of Rh+ve was around 97.4%, while the frequency of Rh-ve was 2.7% similar distributional pattern.

Out of 306 cases in our study, 85 had A blood group in which 5 (5.9%) had moderate hemoglobin levels, 11 (12.9%) had mild anemia, and 69 (81.2%) had levels that were normal. B blood group has 12 (13.6%) have moderate anemia, 7 (8.0%) have mild anemia, and 69 (78.4%) were normal. 22 people with the blood type AB were 1 (4.5%) had severe anemia, 2 (9.1%) had mild anemia, and 19 (86.4%) of the normal. Among the 111 members of the O blood group 0.9% had severe anemia, 8.1% had moderate anemia, whereas 13.5% had mild anemia, and 86 (77.5%) had hemoglobin levels that were normal. So the association of the hemoglobin values and the blood groups in our population shows with the blood group AB (4.5%) in severe anemia, B (13.6%) group shows moderate anemia, O (13.5%) group shows in mild anemia, and AB (86.4%) group has hemoglobin levels in a normal limit (Table :1). Reshmarani et al[2], show analysis of the distribution on patients by blood types and their association with anemia, revealed that anemia was more common in blood type B (41.2%), followed by blood type AB (40.0%), blood type A (33.3%), and blood type O (25.8%), which is inconsistent to our study. Kumar A et al[12], that people with blood group B were more likely to get anemia, followed by people with blood group O, A, and least likely is someone with blood group AB. Shah G et al[9], shows B positive blood group has the highest percentage of anemia, followed by A positive, so it's not similar to our study.

The association between Rh(D) and hemoglobin in our study indicates with 96.4% (295) Rh positive and 3.6% (11), Rh(D) negative. In 295 Rh(D) positive individuals, 2 had severe anemia, 25 had moderate anemia, 34 had mild anemia, and 295 had hemoglobin levels that were normal. 11 people (3.6%) were Rh(D) negative. 1 Rh(D) negative in both mild and moderate anemia and the remaining 9

Rh(D) negative were normal hemoglobin level(*Table: 2*).

Kumar BA et al[11], mentioned, in the population there is no correlation between the Rh factor and the development of anemia. Kumar A et al[12], there was no noticeable difference between the students Rhesus positive and Rhesus negative.

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Table 1: Blood group and hemoglobin association

		HB Grading				Total
		Severe	Moderate	Mild	Normal	
BG	A	0.0%	5.9%	12.9%	81.2%	100.0%
	AB	1	0	2	19	22
		4.5%	0.0%	9.1%	86.4%	100.0%

	B	0	12	7	69	88
		0.0%	13.6%	8.0%	78.4%	100.0%
	O	1	9	15	86	111
		0.9%	8.1%	13.5%	77.5%	100.0%
Total		2	26	35	243	306
		0.7%	8.5%	11.4%	79.4%	100.0%

Current study P value: 0.141(Not significant)

Table 2: Rh(D) and hemoglobin association

HB grading	RH D		Total
	Positive	Negative	
Severe	2	0	2
	100.0%	0.0%	100.0%
Moderate	25	1	26
	96.2%	3.8%	100.0%
Mild	34	1	35
	97.1%	2.9%	100.0%
Normal	234	9	243
	96.3%	3.7%	100.0%
Total	295	11	306
	96.4%	3.6%	100.0%

Figure 1: Age distribution of pregnant women

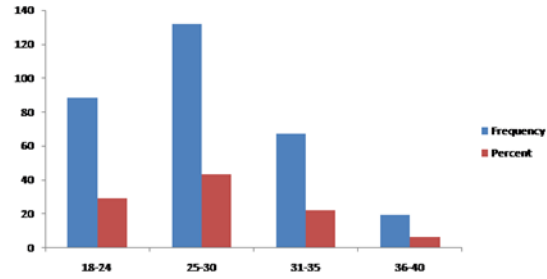


Figure 2: Hemoglobin distribution

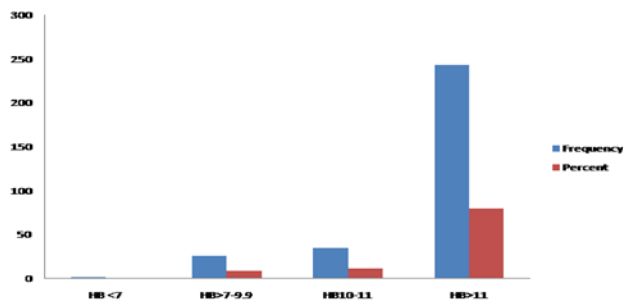


Figure 3: Rh(D) Blood group

