

# Frequency of ABO and Rh (D) Blood Groups and Hemoglobin Threshold among Pregnant Women in Family Guidance Association, Mekelle Model Clinic, North Ethiopia.

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## Abstract

This study was aimed to determine the frequency of ABO and Rh blood group patterns and hemoglobin threshold among pregnant women screened at Family Guidance Association of Ethiopia, North Area Mekelle model clinic. Checklists were prepared to collect data from laboratory registration books of five years to undergo this retrospective study. Those registration books were reviewed for ABO blood group, Rh profiles and hemoglobin threshold of the pregnant women screened during the specified period. A total of 5987 pregnant women have been found to be screened and the predominant phenotype in this study was O (41.5%) followed by phenotype A (28%), Phenotype B (25%) and phenotype AB (5.5%). Regarding Rh (D) system, 91.2% (5458/5987) women were positive for rhesus D antigen while the remaining 8.8% (529/5987) women were negative for the antigen. Blood grouping studies should be done in every region of the nation so that national transfusion policies can be drafted and supplying blood to the needy patients during emergency will be easier.

**Key words:** ABO, Ethiopia, Rh, Tigray

## 1. Introduction

The human red blood cell membrane is complex and contains a variety of blood group antigens, the most clinically significant being the ABO and the Rh system. Following their discovery, it was clearly indicated that the genes of the ABO and Rh (D) are located on chromosome 9 and 1 respectively [1, 2]. Blood groups are genetically determined and majorities of them are inherited in a simple Mendelian fashion [3].

Knowledge of blood group distribution is important for clinical studies, for reliable geographical information and it will help in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths. The role of ABO and Rh grouping is not only in blood transfusion practice, it is also useful in population genetic studies, researching population migration patterns and resolving certain medico legal issues, particularly of disputed paternity cases. In modern medicine besides their importance in evolution, their relation to disease and environment is being increasingly important [4]. It is therefore imperative to have information on the distribution of these blood groups in any population group [5].

Effective management of blood banks and safe blood transfusion services can be augmented by the knowledge of distribution of ABO and Rh blood groups at local and regional levels [6]. Similarly identification of Rh system is important to prevent the erythroblastosis fetalis; which commonly arises when an Rh negative mother carries an Rh positive fetus [7].

In modern medicine besides their importance in evolution, the relation of ABO and Rh groups to disease and environment is being increasingly important. For instance Blood groups are known to have some association with diseases like duodenal ulcer, diabetes mellitus, urinary tract infection, Rh incompatibility and ABO incompatibility of newborn and recently with anemia [8].

The ABO blood group distribution varies in different geographical and ethnic groups. Nevertheless, in almost all, O positive blood group is the predominant followed by A blood group while AB is the rarest which is in line with the finding of this study. A study conducted in the neighboring country, Sudan indicated predominance of O phenotype followed by A, B and AB phenotypes [9]. Other studies in Pakistan showed that blood group B is

rather the most common [10]. Blood group A was the most abundant phenotype in a study conducted in Nepal [11]

No studies have been conducted to date regarding the spectrum of ABO and Rh blood groups in this area. In light of this, we conducted the retrospective study to document the frequency of ABO, and Rh blood groups and hemoglobin threshold in pregnant women screened at Family Guidance Association North Area Model clinic, Tigray Ethiopia.

## 2. Materials and Methods

This retrospective study was conducted at Family Guidance Association of Ethiopia Northern Area (FGAENA) Mekelle model clinic which is found in Mekelle City, North Ethiopia. The Family Guidance Association clinic provides comprehensive sexual and reproductive health services like antenatal care (ANC), Delivery, post-natal care (PNC), family planning services, legal-safe abortion care, and maternal and child health care. Every month there are more than a hundred ABO and Rh blood grouping performed for Antenatal and safe abortion care of pregnant mothers.

### 2.1 Reviewing laboratory registration books

Checklists were prepared to collect data regarding frequency and distribution of ABO and Rh groups of the screened pregnant women from laboratory registration books of the clinic from July 2009 up to July 2014. A total of 5987 pregnant women were screened at the clinic within the five years period. As per this review, 4321 pregnant women were Antenatal Care (ANC) attendants, whereas 1666 women had visited the clinic for Comprehensive Abortion care (CAC).

### 2.2 Determination of ABO and Rh Blood Groups

Blood group determination was done with forward and reverse cell typing using test tube agglutination method. Antiglobulin technique was applied to confirm Rh negativity [3].

### 2.3 Estimation of hemoglobin threshold

The laboratory unit of the clinic is also devoted for estimation of hemoglobin and other hematoimmunological parameters using the CELL-DYN 180. The CELL-DYN method is the best laboratory method for the quantitative determination of hemoglobin. It serves as a reference for comparison and standardization of other methods [17].

## 3. Results

The total number of pregnant women who visited the clinic and tested for blood group from July 2009 to July 2014 was 5987. The screened women were in the age range of 17-40 years. As it can be seen in table 1 below, group O was found to be the most abundant blood group, 41.5% (2482/5987); followed by blood group A, 28% (1674/5987); blood group B, 25 % (1501/5987) and blood group AB, 5.5% (330/5987). Out of the total women screened 8.8 % (529/5987) of them lack Rh antigen in their blood. The negativity rate for Rh antigen was higher in O blood group (3.7%), followed by B blood group (2.3%), blood group A (2.2%) and AB blood group (0.6%).

Table 1: Spectrum of Blood groups of ABO and Rh (D) of pregnant women screened at Family Guidance Association Mekelle Model Clinic.

Blood group spectrum	Total No (%)	Rh (D) +ve (%)	Rh (D)-ve (%)
O	2482(41.5)	2259	223(3.7)
A	1674(28)	1545	129(2.2)
B	1501(25)	1358	143(2.3)
AB	330(5.5)	296	34(0.6)
Total	5987(100)	5458	529(8.8)

As it is indicated in table 1, about half of the women screened were in the age range of 17-24 years, 50.5% (3024/5987). On the other hand 29.5 % ( 1764/5987) were between 25-29 years old and the rest 20 % (1199/5987) were between the ages of 30-40 years. The retrospective study has also revealed that teenager pregnant women (under 19 years of age) accounted about 3.2% (192/5987).

Table 1: Spectrum of Blood groups of ABO and Rh (D) among different age groups of pregnant women screened at Family Guidance Association Mekelle Model Clinic.

Blood group spectrum	Age groups (years)			Total
	17-24	25-29	30-40	
O	1231	749	502	2482(41.5%)
A	856	512	306	1674(28%)
B	753	421	327	1501(25%)
AB	184	82	64	330(5.5%)
Total	3024(50.5%)	1764(29.5%)	1199(20%)	5987(100%)

The laboratory unit of the clinic is also devoted for estimation of hemoglobin and other hematoimmunological parameters using the CELL-DYN 180. When the average hemoglobin threshold of pregnant women was reviewed, 10.3% (615/5987) of the women were mildly anemic (Hgb threshold between 10 and 10.9g/dl) and 7.3% (436/5987) of them had moderate anemia (Hgb threshold between 7 and 9.9g/dl). Severe anemia was not reported in this retrospective study.

Table 3: Hemoglobin profile of different blood groups among the age categories of pregnant women screened at Family Guidance Association Mekelle Model Clinic.

Blood group Spectrum	Hgb threshold (g/dl)	Age groups (years)			Total (%)
		17-24	25-29	30-40	
A	7.0-9.9	39	23	18	80(1.4)
	10.0-10.9	60	38	29	127(2.1)
	>11.0	757	451	259	1586(24.5)
B	7.0-9.9	45	42	22	109(1.8)
	10.0-10.9	75	43	27	145(2.4)
	>11.0	633	336	278	1422(20.8)
AB	7.0-9.9	18	11	11	40(0.7)
	10.0-10.9	26	17	9	52(0.9)
	>11.0	140	54	44	238(3.9)
O	7.0-9.9	93	63	51	207(3.5)
	10.0-10.9	117	91	83	291(4.9)
	>11.0	1021	595	368	1984(33.1)
<b>Total</b>		<b>3024(50.5)</b>	<b>1764(29.5)</b>	<b>1199(20.0)</b>	<b>4987(100)</b>

#### 4. Discussion and Conclusion

As the present retrospective study is an institutional based, all study subjects were female gender. Majority of the women were in the ages of 17-24 indicating early pregnancy in the population. About 28% of the women have made legal abortion and hence they were provided comprehensive abortion care (CAC) in the clinic.

The ABO blood group distribution varies in different geographical and ethnic groups. Nevertheless, in almost all, O positive blood group is the predominant followed by A blood group while AB is the rarest which is in line with the finding of this study [15].

Comparable results were reported in Pakistan where blood group B is rather the most common phenotype [10]. Blood group A was the second most abundant phenotype in this study (28%), which was in contrast with a study in Nepal where phenotype A is the predominant phenotype [11].

Rh (D) distribution also varies worldwide. Rh(D) negative blood group is documented as 5.5% in south India [12], 5% in Nairobi [13], 4.8% in Nigeria [14], 7.7% in Rawalpindi [10]. About 95% of African – Americans are Rh-positive whereas indigenous Africans are virtually 100% Rh-positive [15]. In contrast, the present study showed that 8.8% of the women were rhesus D negative.

Even though the spectrum of ABO blood group in this study is similar with other studies conducted in Ethiopia, Rh negativity was lower in the present study. The study conducted in Gilgel Gibe research Center, Southwest Ethiopia where 955 men and 1010 women were included, the Rh negativity was 14.8% [15]. As indicated in **table 1** Rh negativity in the present study was 8.8%.

There is known genetic association of specific blood groups to certain diseases in certain population. Studies concerned about possible association between ABO blood group and cardiovascular diseases have confirmed that persons of group A are affected more frequently with coronary heart disease, ischemic heart disease, venous thrombosis and atherosclerosis, while its low in people with blood group 'O' which stated to have protective effect against these diseases [16].

Recent studies also indicated existence of association between ABO blood groups and anemia [6]. In the present study relatively greater number of women with blood group O has lower thresholds of hemoglobin than the rest phenotypes. This is in sharp contrast with a study in India where anemia was relatively prone to the individuals having blood group B, A or AB [6]. Further studies should be conducted to indicate association of blood groups with anemia and other disease.

The predominant phenotype in this study was O followed by phenotype, Phenotype and phenotype AB. About 8.8% of the women are negative for Rh (D) antigen. The present study was limited to an institution where women only are recruited and hence lacks representativeness of the national ABO and Rh spectrum. So, blood grouping studies should be done in every region of the nation so that national transfusion policies can be drafted and supplying blood to the needy patients during emergency will be easier.

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