

Distribution of ABO and Rhesus Blood Groups Among the Population of Mymensingh District and the Students of University of Dhaka, Bangladesh

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ABSTRACT

Background: Determining blood grouping and cross-matching is an essential prerequisite for blood transfusion. Nearly 400 red cell antigens have so far been discovered. Among the available blood group systems, ABO blood group system was first to be identified and Rh blood group system was the fourth one. Both are most important for blood transfusion purposes. This study was conducted to determine the distribution of ABO and Rhesus (RhD) blood groups among people of Mymensingh District and the students of Shahidullah Hall, University of Dhaka, Bangladesh.

Methods: A total of 4264 subjects were included in this study. From each subject blood was collected, ABO and RhD blood grouping were carried out by tile method using commercially prepared anti sera. The frequency of each type was calculated.

Results: Out of 4264 subjects, 3390(79.8%) were male and 856 (20.16%) were female. The distribution of ABO blood group shows that 'B' group blood comprised one-third (33.7%) of the participants and 'O' formed the second leading blood group (31.5%). Blood group 'A' and 'AB' consisted of 25.6% and 9.2% of the participants respectively (table 1). (Rh-typing revealed that majority (98%) of the participants was Rh positive (Fig. 1). Distribution of ABO blood groups between sexes was almost identical ($p = 0.112$) (table II). Rh negativity was found to be significantly associated with blood group A ($p = 0.013$) (table III).

Conclusion: The study concludes that blood group-B occurs in highest frequency and the blood group-AB in lowest frequency among males, while blood group-O was the highest and group-AB was the lowest among females.

Keywords: ABO blood group and RhD blood group.

Introduction

There are approximately 400 red blood cell antigens. Of them, ABO and Rhesus blood groups are the most important blood groups clinically.¹ Landsteiner first described the ABO blood group in 1900 which initiated launching of blood banking and transfusion medicine.² Even after 100 years, the single most important test performed in blood banking services is determination of ABO blood groups to avoid transfusion reaction and death.³ The presence of Rhesus blood group was recognized in 1939.⁴ The ABO blood group individuals are divided into four major blood groups namely, A, B, AB and O according to the presence of antigens or agglutinogens and agglutinins. Group A blood has type A antigens, group B blood has type B antigens, group O blood has neither A nor B antigens and group AB has both A and B antigens. Plasma from blood group A contains Anti-B antibodies which act against type B antigens, whereas plasma from type B blood contains Anti-A antibodies, which act against type A antigens. Blood group AB has neither A nor B antibodies, blood group O has both A and B antibodies. The former is,

therefore, called universal recipient and the latter is referred to as universal donor (Seeley *et al*, 1998).¹

The incidences of ABO and RhD groups vary markedly with respect to geographic and racial variation. In Caucasians (in the United States), the group O is the predominant (47%) followed by group A (41%), group B (9%) and AB (3%). Among the African Americans group O occurs in highest frequency (46%). Then follows group A (27%), group B (20%) and group AB (7%). A similar distribution is observed among the Orientals with highest and lowest incidences being O (36%) and AB (13%) respectively, while group A and group B lies in between them (28% and 23% respectively) (Pramanik & Pramanik, 2000)⁵. In Ogbomoso, Oyo State Nigeria, 50% of the population have blood group O, 22.9% blood group A, 21.3% group B, and 5.9% group AB (Bakare *et al*, 2006).⁶

One of the antigens on the surface of red blood cells, the Rhesus antigen (named because a related antigen was first discovered in Rhesus monkeys), is found on the red cells of approximately 85% of the people of United States. This is the second most important blood group system due to its immunogenicity in RhD negative individuals in blood

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transfusion or pregnancy (Dennis *et al*, 1998).⁷ Individuals are considered Rh positive if they have RhD antigen and Rh negative if they do not have this antigen. Rhesus incompatibility can pose a major problem in pregnancies when the mother is Rhesus negative and the fetus is Rhesus positive. If foetal blood leaks through the placenta and mixes with the mother's blood, the mother becomes sensitized to Rhesus antigen. The mother produces RhD antibodies that cross the placenta and cause agglutination and haemolysis of fetal red blood cells. This is called haemolytic disease of the newborn (HDN) and its severity may worsen in subsequent pregnancies if not properly managed (Dennis *et al*, 1998). RhD antigen distribution varies from one population to the other. RhD negative blood group is documented as 5.5% in South India, 5% in Nairobi, 4.8% in Nigeria, 7.3% in Lahore, 7.7% in Rawalpindi (Bhatt & Amen 1996; Mawuagi, 1999).^{8,9} About 95% of African Americans are RhD positive.

As both ABO and RhD blood group varies with respect to race, it is imperative for the planners and policy-makers to know the distribution of blood grouping of each racial and ethnic group residing in a defined geographic territory of a country. Knowledge of blood group distribution is important for clinical and forensic studies. However, no nation-wide survey has yet been conducted in Bangladesh to know the distribution of blood group of its population. The present study was one such step, although in small scale, to highlight the distribution of ABO and RhD blood groups in the population of Mymensingh district and Dhaka city.

Material & methods

Collection of study population and blood sample:

A total of 4264 subjects participated in this study. Of them 2,570 were collected from the Medicine Club of Mymensingh Medical College Hospital (donors and patients of both sexes) January 2009 to December 2009 and 1694 male students enrolled from Shahidullah Hall, Dhaka University between 2006 to 2008. In case of hospital subjects (both donors and recipients), data pertaining to key variables of interest were collected from each subject and were noted down on a structured questionnaire. Blood samples were collected under aseptic condition from anti-cubital vein for determination of blood groups, and the blood groups of students of Shahidullah Hall, Dhaka University were collected from the free blood donating organization, Badhon.

ABO and RhD blood group tests

The ABO and Rhesus blood grouping were done using the tile method. A drop of blood from each subject was placed on a clean white tile in three places. A drop of each of the antisera, anti-A, anti-B and anti-D were added and mixed with each blood sample using a glass rod and blood groups were determined on the basis of agglutination.

Results

Of the 4264 subjects who participated in the study, 3390(79.8%) were male and 856 (20.16%) were female. The distribution of ABO blood group shows that 'B' group blood comprised one-third (33.7%) of the participants and 'O' formed the 2nd leading blood group (31.5%). Blood group 'A' and 'AB' consisted of 25.6% and 9.2% of the participants respectively (table 1). (Rh-typing revealed that majority (98%) of the participants was Rh positive (Fig. 1). Distribution of ABO blood groups between sexes was almost identical ($p = 0.112$) (table II). Rh negativity was found to be significantly associated with blood group A ($p = 0.013$) (table III).

Table-1: Distribution of study participants by ABO blood grouping (n = 4264)

ABO blood group	Frequency	Percentage
A	1093	25.6
B	1437	33.7
O	1341	31.5
AB	393	9.2

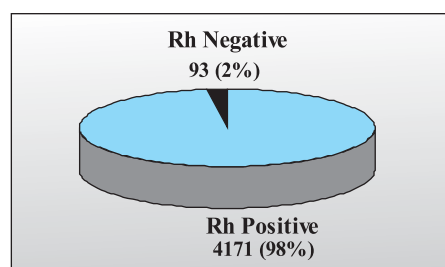


Fig. 1: Distribution of participants by RhD typing

Table-2: Distribution of ABO blood group according to sex (n = 4264).

Sex	Number (n)	ABO blood group				p-value
		A (n=1093)	B (n=1437)	O (n=12341)	AB (n=393)	
Male	3390	894(81.8)	1140(79.3)	1043(77.8)	313(79.6)	0.112
Female	874	199(18.2)	297(20.7)	298(22.2)	80(20.4)	

Data were analysed using Chi-square (χ^2) Test; figures in the parentheses indicate corresponding percentage.

Table-3: Relationship between ABO and RhD blood grouping (n = 4264)

ABO Blood group	RhD Grouping		p-value
	RhD positive (n = 4171)	RhD negative (n = 93)	
A	1057(25.3)	36(38.7)	0.015
B	1408(33.7)	29(31.2)	
O	1316(31.6)	25(26.2)	
AB	390(9.4)	3(3.9)	

Discussion

In the present study 'B' group blood comprised one-third of the participants (33.7%) and 'O' lies in close proximity to 'B' (31.5%). Blood group 'A' comprised 25.6% of the participants and 'AB' the least (9.2%). These findings are closely consistent with a study conducted in Pakistan, where blood group 'O' was the most common (35%), blood group 'B' was the second most common (33%), 'A' the third (24%) and 'AB' the fourth (8%) in ranking order.² However, these findings differ with those found in Caucasian and European population. In the United States nearly half (47%) of the Caucasian population has blood group 'O', and 'A' is the next dominant group (41%). Blood group 'B' is third in descending order (9%) and 'AB' the fourth (3%),¹ while the Blacks in the same country has somewhat different distribution with 'O' being the highest (46%) and 'B' the lowest (2%), while 'A' (27%) and 'AB' (7%) lying in between them. The Western Europeans also has a similar distribution with group 'O' occurring in highest frequency (46%) followed by group 'A' (42%), group 'B' (9%), group 'AB' (3%). In Lagos Nigeria, blood group 'O' is found in over 55% of cases 'A' 25.3%, 'B' 16.7% and 'AB' 2.7%.¹⁰ Thus, the segregation of the genes responsible for ABO blood grouping has always taken a particular pattern for its distribution.

The present study revealed that majority (98%) of participants had RhD positive blood. A similar distribution was also observed in other studies. RhD negative blood group was documented in 5.5% in South India, 5% in Nairobi Kenya, 4.5% in Nigeria, 7.5% in Lahore, 7.7% in Rawalpindi.^{8,9,11,12}

From the findings of the present study and those of other studies discussed so far, it is evident that blood group 'O' dominates irrespective of race and geographical distribution, 'AB' is the least common and rare group of blood, while 'A' and 'B' show little variation with respect to racial variation. The findings of the study have

significant implication in the management of blood bank and transfusion services in this area.

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