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Study of Distribution of ABO and Rh Blood Groups among First Year Medical Students in Dinajpur Medical College, Dinajpur, Bangladesh

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Abstract **Original Research Article**

The ABO and Rh blood group systems are fundamental to the fields of transfusion medicine and blood banking, with the ABO system's discovery by Karl Landsteiner in 1900 marking a significant milestone in these domains. The distribution of ABO and Rh blood groups significantly varies across different populations and is crucial for effective blood bank management and transfusion services. A cross-sectional study was conducted on first year MBBS medical students in the Dinajpur Medical College, Dinajpur, Bangladesh from January to December 2021. Total of 120 medical students, 40 males and 80 females, samples were collected by finger prick method under aseptic precautions. The ABO blood grouping and Rhesus factors (Rh) typing determined by glass slide method, which is based on antigen antibody agglutination. ABO blood group system classifies blood groups of people into four different types namely A, B, O and AB. The need for the study of frequency distribution of blood group is multipurpose. Out of total 120 participants 80 were female students and 40 were male students. Among the most common blood group was O (42.5%) followed by B (29.2%), A (16.6%), AB (11.6%). 80.8 % students were Rh positive and 19.2 % were Rh negative and O + is (30.8%) commonest blood group among 120 students and A- and AB – are rarest blood groups (1.6%). This study may enable us to contact individuals belonging to a particular blood group at times of medical emergencies when blood transfusion is required. Knowledge of blood group distribution is important for clinical studies, for reliable geographical information, blood bank management and for forensic studies in the population. Such a study would create awareness about self-blood grouping and also enable one to prepare a database of the available blood groups which can be utilized during medical emergencies for safe blood transfusion.

Keywords: ABO, Rh-D, Blood group system, Medical Student.

INTRODUCTION

The ABO and Rh blood group systems are fundamental to the fields of transfusion medicine and blood banking, with the ABO system's discovery by Karl Landsteiner in 1900 marking a significant milestone in these domains [1]. This discovery, crucial for the safe practice of blood transfusions, remains a cornerstone in blood banking over a century later, emphasizing the vital importance of blood type determination to prevent adverse reactions and fatalities [2,3]. The Rhesus system, identified in 1939 and further elucidated in subsequent years, further complements the understanding of human blood group systems [4,5]. The Rh blood group system was discovered during 1939–1940 by Landsteiner, Weiner, Levine and Stetson, clarifying the basis of many unpredicted transfusion reactions. In 1945, Coombs, Mourant and Race described the use of antihuman globulin (Coombs test) for incomplete antibodies [6]. Later, these two systems have substantiated to be the most important in transfusion medicine. Today, the requirement for blood group frequency and prevalence studies is multiuse, besides their importance in relative to blood transfusion and organ transplantation. Human red blood cells contain on their surface a series of glycoproteins and glycolipids, which constitute blood group antigens Development of these antigens are genetically controlled and they appear early in fetal life and remain unchanged till death [7]. The major ABO blood group system is divided into four blood types on the basis of presence or absence of A and B surface antigens. The blood groups are A, B, O and AB. The frequency of four main ABO blood groups varies in the population throughout the world. ABO blood group

system derives its importance from the fact that A and B are strongly antigenic and anti A and anti B naturally occurring antibodies present in the serum of persons lacking the corresponding antigen and these antibodies are capable of producing intravascular hemolysis in case of incompatible transfusion [8]. Knowledge of blood type distribution is particularly vital for clinical investigations, for minimizing maternal mortality rates by ensuring access to a safe and ample blood source. It is also used in genetic studies, migration patterns, hemolytic disease elimination of newborn attributed to Rh incompatibility, personality identification, and to address certain medical conditions, medico-legal issues, especially paternity disputes, while ensuring compatible blood transfusions. For this reason, the Rh status is routinely determined in blood donors, transfusion recipients, and in mothers-to-be [9]. Acquiring knowledge on distribution of ABO blood groups at local and regional levels will not only be helpful in the effective management of blood banks but also in safe blood transfusion services [10]. Hence, the present study was planned with the aim of determining the distribution of ABO and Rh blood groups in healthy young adults in college.

MATERIALS AND METHODS

A cross-sectional study was conducted on first year MBBS medical students in the Dinajpur Medical College, Dinajpur, Bangladesh from January to December 2021. Total of 120 medical students, 40 males and 80 females, samples were collected by finger prick method under aseptic precautions. The ABO blood grouping and Rhesus factors (Rh) typing determined by glass slide method, which is based on antigen antibody agglutination. Commercially available standard anti sera A, anti-sera B and anti-sera D were used for the study. RBCs suspended in isotonic saline were treated with anti-A, anti-B and anti-D anti sera on separate glass slides, marked as A, B and D and mixed with separate applicator sticks. The mixture observed for agglutination, both macroscopically and microscopically and compared with the control. The blood group was determined based on agglutination with the corresponding anti sera. If agglutination was present in the blood drop A, then it belongs to A blood group, agglutination in blood drop B, B group, agglutination in both A and B blood drops, AB group and if no agglutination in both A and B drops, then O group. Similarly, agglutination in blood drop D was considered as Rh Positive and no agglutination Rh negative. The data was expressed as percentages.

Inclusion Criteria

The following criteria were included in the study:

- 17–21 years
- Healthy and free from diseases.

Exclusion Criteria

- All students unhealthy or suffering from any medical condition or disease were excluded from the study.

All of the students in the research were between the ages of 17 and 21, and they were all healthy and disease-free. The finger-prick technique was used to obtain blood. Four separate glass slides labeled A, B, D, and C (control) were employed to assess if the A, B, AB, and O groups belonged to Rh-positive or Rh-negative. On clean glass slides, a drop of standard monoclonal antisera- anti A, anti-B, and anti-D (Standard antisera technique) was mixed thoroughly with a drop of RBC suspension made from finger-prick blood and normal saline. The agglutination results were subsequently recorded and validated using low- power microscopy. [9]

RESULTS

Out of total 120 participants 80 were female students and 40 were male students (Table 1). Table 2 Shows that most common blood group was O (42.5%) followed by B (29.2%), A (16.6%), AB (11.6%). Table 3 shows that 80.8 % students were Rh positive and 19.2 % were Rh negative. Table-4 shows O + is (30.8%) commonest blood group among 120 students and A- and AB – are rarest blood groups (1.6%).

Table-1: Gender and number of participant students

Gender	Number of students	%
Male	40	33.3%
Female	80	66.7%

Table-2: Distribution of ABO blood group among students

Blood groups	Number of students	Percentage of students
A	20	16.6%
AB	14	11.6%
B	35	29.2%
O	51	42.5%

Table-3: Distribution of Rh blood group among students

Blood Group	Number of students	Percentage
Rh Positive	97	80.8%
Rh Negative	23	19.2%

Table-4: Details of ABO and Rh blood group distribution among students

Blood groups	Number of students (120)	Percentage
A rh Positive	18	15%
B Rh Positive	30	25%
AB Rh Positive	12	10%
O Rh Positive	37	30.8%
Arh Negative	2	1.6%
B Rh Negative	5	3.3%
AB Rh Negative	2	1.6%
O Rh Negative	14	11.6%

DISCUSSION

Blood grouping is an important parameter for social, professional and medical needs. In the present study, the frequency of blood group O was the highest (42.5%) and the least frequency was that of blood group AB (11.5%). Several studies within the Telangana state [11] and rest of India [12-16] and other countries [17-19] have reported variations in the blood group distribution in diverse populations. This study helped in analyzing the distribution of blood groups among college students who comprise a heterogeneous population within this region. There has been very little research conducted across Bangladesh to investigate this variance. In all of these researches, the "B" type was most prevalent, while "AB" was identified as the least common [20-22]. Outcomes were similar to this study, with "B" being most common and 'AB' least common blood group. The B blood group was the most prevalent in this research, followed by the O blood group. This outcome is similar to the previous Indian research [23-25]. However, the B antigen has a low overall prevalence globally, especially in parts of North and south part in Bangladesh where the O antigen blood group is prevalent [26-28]. The study also calculates the gene frequency of ABO and Rh(D) genes using the conventional Hardy Weinberg equilibrium assumption. The actual ABO and Rh blood type distributions did not deviate much from the Hardy Weinberg equilibrium predicted. These findings matched those of Khan MS *et al.*, Mahmood MA *et al.*, [29,30]. This research focused on prevalence of ABO and Rh-blood groups, and the outcomes posit that B type is more prevalent in both genders among the medical students studied, while AB is the least common type. Everyone needs to be aware of their blood type. This information aids us in saving lives in the event of a medical emergency that necessitates a transfusion. However, printing blood group information on identity cards, driver's licenses, and other documents will be extremely useful in an emergency transfusion. Furthermore, knowing one's blood groups and practicing blood typing and cross-matching regularly will help avoid difficulties from mismatched transfusion reactions. These findings are crucial for enhancing blood bank management and transfusion services in the region, catering specifically to the local demographic needs. Moreover, understanding these patterns can aid in epidemiological studies and potentially inform healthcare strategies, especially in the context of diseases associated with specific blood groups.

CONCLUSION

The study confirms that blood group O was the commonest of the ABO blood group system among the medical students studied and AB blood group was the least. Rhesus positive was commoner than Rhesus negative. Knowledge of blood group distribution is important for clinical studies, for reliable geographical information, blood bank management and for forensic studies in the population. Such a study would create awareness about self-blood grouping and also enable one to prepare a database of the available blood groups which can be utilized during medical emergencies for safe blood transfusion.

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