Frequency of A2 Blood Group Among A Blood Group

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ABSTRACT

Background: Transfusion medicine is an important branch in the field of medicine and patient care. Prior knowledge and identification of subgroups of ABO blood group system is important in blood transfusion, inheritance pattern, genetics and disease susceptibility. Getting right donor in right time in right place is sometimes a challenge in patient care. Safe blood transfusion means identical blood transfusion to benefit a patient without causing any adverse effect. So proper blood typing is mandatory. Still now there is no data on frequency of rare A2 blood group in Bangladesh Armed Forces as well as in Bangladesh. Aim: To see the frequency of A2 blood group among ABO blood groups in Bangladesh Armed Forces and Bangladesh. Materials and Methods: A total of 200 patients with blood group A irrespective of age and sex were included in this retrospective study and the study was carried out in the Department of Transfusion Medicine, Armed Forces Institute of Pathology (AFIP), Dhaka Cantonment, Dhaka, Bangladesh from 01 June 2021 to 30 June 2021. Blood grouping was performed by slide method and Anti-A1 reagent is used to differentiate blood group A1 from blood group A2. Results: Among 200 A blood group individual 198 were typed as A1 (99%) and 02 were typed as A2 (01%). Among those two one had anti A1 antibody while other didn't have. Conclusion: A2 is a rare subtype of A blood group. Care should be taken during routine ABO grouping especially in cases of discrepancies or mix-field or weak positive reactions in A blood group.

Keywords: ABO blood group, A1 blood group, A2 blood group

Introduction

Karl and Land Steiner are called the fathers of Transfusion Medicine because of their historic discovery of antigens of the ABO blood group system (i.e., A, B, and H antigens) and Rhesus factor more than one century ago.¹ This discovery enabled the physicians to transfuse blood without imperilling the patient’s life. The International Society for Blood Transfusion (ISBT) has recognized 346 blood group antigens. Out of these, 308 have been designated in 36 blood group systems while 38 are still not assigned to any blood group system.² Among all human blood group systems, ABO (ISBT designation 001) also known as histo-blood group system, is at the centre of the stage. The ABO antigens are defined by carbohydrate moieties. Apart from red cell, ABO
blood group antigens are also found on the surface of platelets and lymphocytes. Non haemopoietic cells also express these antigens like cells in the vascular endothelium, intestine, cervices, urethra, and mammary glands. Different secretions like saliva, tears, and milk also contain these ABO antigens. In peripheral blood stem cell and organ transplantation, ABO antigens play crucial role in successful transplantation. ABO and Rh D system also have a key role in evolutionary biology, anthropology, studying migration patterns, forensic pathology, and medico-legal issues such as unmatched pregnancy and disputed paternity. This significance is due to the presence of “naturally occurring IgM anti-A” antibody produced by stimulated B cells directly without the assistance of helper T cells and thymus dependence against environmental agents in individuals they lack the corresponding antigen. Because of this, mismatch blood transfusion can cause severe clinical manifestations.

The most common subtypes of A are A1 and A2. Other less prevalent subtypes of A include A3, Ax, A_end, A_y and A_el. There are qualitative and quantitative differences between A1 and A2. A1 and A2 differs in their chemical structures. People with A1 phenotype express A_a, A_b, A_c and A_d antigenic determinants, but A2 individuals have only A_a and A_b antigenic determinants. Absence of A_c and A_d is assumed to be a cause of development of anti-A1 in A2 subtypes. Usually anti-A1 exist as naturally occurring IgM. Patients with A1 antigen if are transfused or transplanted from A2 individuals having Anti-A1 can cause ABO discrepancies, it can develop haemolytic transfusion reaction.

The present study was undertaken to find out the prevalence of blood group A2 among Armed Forces personnel. As these individuals are coming here from Combined Military Hospital, Dhaka and different private and public hospitals, they partly represent the entire population of Bangladesh. Therefore, the prevalence of blood group A2 found in this study partly represents the entire Bangladesh.

Materials & methods
This study is an observational retrospective cross-sectional study conducted at the Department of Transfusion Medicine, Armed Forces Institute of Pathology, Dhaka Cantonment, Bangladesh. The study was carried out over a period of 01 months, from 01 June 2021 to 30 June 2021. A total of 200 individuals came to the Department of Transfusion Medicine either for blood grouping or donation or transfusion purposes having blood group A were included in this study. Two ml of EDTA anti-coagulated blood was collected under aseptic condition. Blood grouping done by forward and reverse way using Tulip Blood grouping sera and locally made pooled A, B and O cell. The A blood group people were tested with Tulip anti A1 sera. Agglutination occurred here was labelled as A1 blood group and absence of agglutination was labelled as A2 blood group. Agglutination was confirmation by microscopic examination. Verbal and written consent were taken from those peoples who were interested to participate in this study.

Results
A total of 200 individuals were included here. Their demography is given in figure 1 and figure 2.

Fig-1: Age distribution of study population (n=200)
In the blood grouping of 200 samples, 198 samples were tested for forward and reverse blood grouping by commercially supplied anti-sera as well as manually pooled blood group cells and was found A1 blood group. Only in two cases, the forward blood grouping showed O blood group and reverse grouping displayed B blood group. Due to these repeated discrepancies, agglutination in forward grouping was examined microscopically which revealed the presence of agglutination meaning the presence of A antigen. Those samples were then tested with Anti A1 sera and agglutination were not detected both macroscopically and microscopically indicating that those samples are containing A2 antigen. So, those individual’s blood group in ABO system is A2. Figure 4 and figure 5 show the forward and reverse blood grouping of those 2 individuals.
Discussion
The frequency of ABO blood group varies in different populations. In Bangladesh prevalence of blood group B is: 37.5%; blood group O is 31.8%; 21.80% and 8.9% were blood group A and AB respectively.9 A is rare among the subtypes of A. Presence of anti-A$_1$ in A$_2$ blood group individual is a major concern as transfusion of A$_2$ blood containing anti-A$_1$ to blood group A individual may cause serious haemolytic transfusion reaction. In this study only 01% A+ among the A subtypes were found which correlates with another study carried out in India. Their prevalence of A$_2$ is 1.07%.10 Development of anti-A$_1$ antibodies in case of A$_2$ blood group after allogeneic stem cell transplantation and organ transplantation have also been reported.7,11

From a transfusion perspective, individuals with A$_2$ should be transfused with identical blood types. However, due to its rarity special attention shall be given if identical blood type is not available and the patient needs transfusion of packed red cells. These individuals can be transfused with O group packed red cells considering it the next compatible group. It should be noted that to date none of the studies conducted in Bangladesh has reported the prevalence of A$_2$ as per literature review.

Conclusion
Correct blood typing is a prerequisite for safe blood transfusion. Otherwise, transfusion as a lifesaving option may turn into life endangering one and this could be overcome only by performing the blood group with validated and potent reagents as well as providing scrupulous eye to both the reverse and forward ABO blood grouping.

Limitations of the study:
Small sample size and single center.

References