ORIGINAL ARTICLE

Blood Groups in the Kashmir Valley

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Abstract

Blood groups are genetically determined and exhibit polymorphism, where different population groups have significant difference in the frequency of each blood group. This study was conducted to determine the frequency of ABO and Rhesus D blood groups among the blood donors. A total number of 1306 blood donors attended the donor centre at SKIMS Medical College Hospital for blood donation in the year 2001-02. After each donation blood samples were collected in separate pilot tubes for the estimation of ABO and Rhesus D blood groups. The frequency of O, A, B and AB, Rhesus D positive and Rhesus D negative were calculated separately. The highest frequency among the ABO blood groups was of B (39.43%) and the lowest was of AB (8.11 %). Among the Rhesus D phenotypes, majority (93.33%) were Rhesus D positive, where as only 6.67% were Rhesus D negative. The prevalence of ABO/Rhesus D was calculated and the highest frequency was of B Rh-D positive (37.44%) followed by O Rh-D positive (28.94%), A Rh-D positive (19.21%), AB Rh-D positive (7.73%), O Rh-D negative (2.90%), B Rh-D negative (1.99%), A Rh-D negative (1.37%) and AB Rh-D negative (0.38%). This study showed that most common group was B followed by O & A and 93.33% were positive for Rh-D phenotype.

Key words

Blood groups, ABO, Rhesus, Phenotypes

Introduction

A series of tests reported by Karl Landsteiner in 1900 led to the discovery of the ABO blood group system and to the development of routine blood group typing procedure (1). Later several other groups, notably the Rhesus (Rh) blood group was identified in 1940 (2). The ABO blood groups are genetically determined antigens present on the surface of the blood cells and most other body cells. These are determined by reaction of an individuals' red cells with specific anti-A and anti-B antibodies. Phenotypically there are four groups i.e. O, A, B, AB determined by three allelic genes located near the tip of the long arm of chromosome 9. These give rise to six possible genotypes OO, AA, BB, AO, BO and AB. The A and B are inherited as codominent traits, while O is

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recessive to both, thus AA and AO are expressed as A and similarly BB and BO as B, while AB are expressed as AB (3). The ABO alleles determine the activity of specific transferases, in which A allele adds N-acetylgalactosamine to the precursor glycoprotein known as H-substance, while the B allele adds D-galactose. In presence of the O-allele the H substance remains unchanged (4,5). The second type of blood groups are Rhesus blood group system, which is also genetically determined, and its gene complex is located on chromosome 1 with two alleles at each of three closely linked loci.(6). These are C, c, E, e, D or no D(expressed as d). There are only two Rhesus D phenotypes and these are Rh-D positive and Rh-D negative depending on whether the Rh-D antigen is present on the red cell or not. The Rh-D positive persons are homozygous or heterozygous for D allele (7). These antigens are determined by the reaction of individual red cells with anti-Rh antibody.

There are many other blood group systems, but ABO and Rh-D are more clinically significant, as these antigens are more immunogenic in origin (8). Interestingly both blood groups exhibit extensive polymorphism in different populations and the frequency at which each of the blood group exists shows considerable variations in different populations (9, 10). This study was conducted with the specific aim to determine the frequency of ABO and Rh-D phenotype in the Kashmir valley in order to find the highest need of blood groups for transfusion practice.

Material and Methods

This study included a total of 1306 blood donors attending the Department of Transfusion Medicine & Immunohaematology at SKIMS medical college hospital. After proper medical check-up, donors blood was collected and blood samples were taken for the estimation of ABO and Rh-D blood grouping. All the Rh-D negative samples were further tested by antiglobulin technique and weak Rh-D positive samples were labelled as Rh-
positive. Reagents used were monoclonal (Mediclone T
kits) from Biotech Pvt. Ltd.

Results

Each sample was labelled according to its AB
phenotype and Rhesus D positive and negative. Th
prevalence of the phenotypes O, A, B and AB wa
calculated and the results are presented in figure 1. Th
most common blood group was B, followed by O and A
Blood group AB occurred at the lowest prevalence.

The prevalence of Rhesus D positive and D negative
phenotypes was calculated and the results are presented
in figure 2. Majority (93.33%) of donors were Rhesus D
positive, where as only 6.67% were Rhesus D negative.

The prevalence of ABO phenotype linked to Rhesus D
phenotype was calculated and the prevalence is presented
in the Table 1. The most prevalent phenotype in our study
was B Rh-D positive (37.44%), followed by O Rh-D
positive (28.94%), A Rh-D positive (19.21%), AB Rh-D
positive (7.73), O Rh-D negative (2.90%), B Rh-D negative
(1.99%) and A Rh-D negative (1.37%). The lowest
prevalence was that of AB Rh-D negative (0.38%).

Table 1. Prevalence of ABO/Rh-D Phenotypes

Rh-D/ABO	O	A	B	AB	Total
Positive	378	251	489	101	1219
Percentage of Positive	28.94	19.22	37.44	07.73	93.33
Negative	38	18	26	05	87
Percentage of Negatives	02.92	01.38	01.99	00.38	06.67
Total	416	269	515	106	1306
Percentage of total	31.86	20.60	39.43	08.11	100

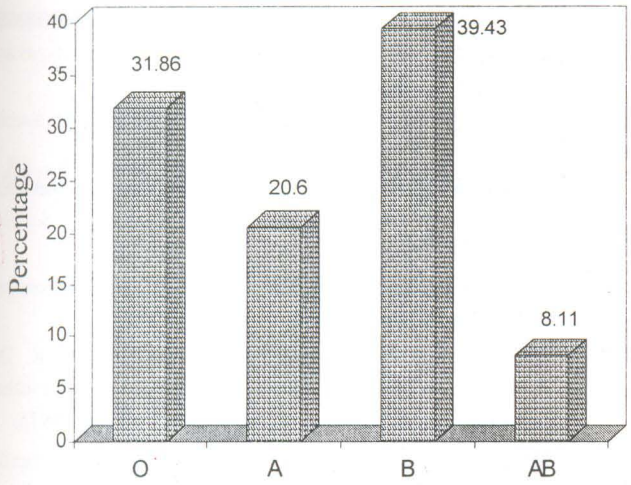

Fig1. Prevalence of ABO Phenotypes

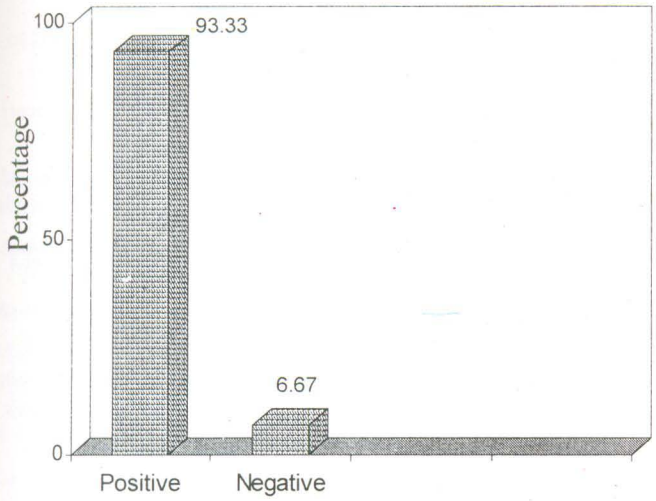

Fig 2. Prevalence of Rh-D Phenotypes

Discussion

This study was conducted to determine the ABO and Rhesus D blood group frequencies in the Kashmir valley. In ABO system, our study shows the highest frequency of blood group B (39.43%), followed by O (31.85%), A (20.59%) and AB (8.11%). Although the subgroups of ABO phenotypes that differ in the amount of antigen carried on red cells and, in secretors, present in saliva are the product of less effective glycotransferases, subgroups of A are commonly encountered than subgroup of B. Fortunately the wide spread use of potent monoclonal anti A and anti B reagents have decreased the number of weak A or B subgroups detected, because monoclonal antibodies are selected for reagent use based on their ability to agglutinate cells with weak aberrant antigen expression (11).

In Rhesus system our study shows 93.33% Rh-D positive and only 6.67 % as Rh-D negative. The difference is observed when the combination of two blood group systems are compared, and the frequencies are: B Rh-D positive (37.44%), O Rh-D positive (28.94%), A Rh-D positive (19.21%), AB Rh-D positive (7.73%), O Rh-D negative (2.90%), B Rh-D negative (1.99%), A Rh-D negative (1.33%) and AB Rh-D negative (0.38%). This shows blood group B Rh-D positive is highest in our population followed by group O Rh-D positive. As for as the Rhesus blood group system is concerned 93.33 % are Rhesus D positive and only 6.67% are Rh-D negative. It means the frequency of Rhesus D negative is low in our population and that is why it is always difficult to find blood for Rhesus D negative patients, although O Rh-D negative blood is slightly more common than other ABO/ Rh-D negative individuals and may be used in emergency to these individuals.

This study has several significant implications. Firstly, it provides information to the transfusion services regarding the highest need of blood group B and O for transfusion purpose in our population. Secondly, it points to a significant health implication. Studies concerning possible association between blood groups and diseases; for example, group O (non-secretors) has about twice the incidence of duodenal ulcers than to secretors of group A or B (12-14). On the other hand group O frequency is lower in persons affected by coronary heart diseases, ischaemic heart diseases, venous thromboembolism, atherosclerosis etc. and these individuals have higher in vitro heparin anticoagulant effect (15-17). Group A carries

a higher incidence of tumors of salivary glands, stomach, and pancreas than group O or A. Persons with Rh null phenotype, whose red cells lack all the Rhesus antigens, have some degree of increased hemolysis. The lower frequency of Rhesus D negative in our population appears the reason for lower incidence of Rhesus hemolytic disease of newborn.

To conclude, as we know the blood group frequencies are different in different parts of the world, we suggest that may be different in different areas of the Kashmir valley. Thus it is necessary to conduct similar studies in order to determine the blood group frequencies in different regions of the Kashmir valley.

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