ORIGINAL RESEARCH PAPER

Volume-8 | Issue-2 | February-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PREVALENCE OF BOMBAY PHENOTYPE IN BLOOD DONORS IN NORTHERN INDIA

Immunohaematology

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ABSTRACT

In Bombay blood group there is no "A" or "B" antigens on red blood cells or in secretions, similar to O' blood group. But there is no expression H antigen, which is present in blood group O. H antigen, is a precursor carbohydrate from which A and B blood groups are formed.

ABO grouping was done by conventional tube technique after washing the donor and reagent RBCs three times with 0.9% normal saline. Samples which showed Bombay phenotype were confirmed by anti-H lectin and saliva inhibition test.

Total 06 cases (i.e. 0.0034%) of Bombay blood group phenotype were detected. Both forward and reverse blood grouping should be done, so that no patient receives wrong blood transfusion. In emergency situation, it is very difficult to supply Bombay phenotype. Therefore maintaining a rare donor registry (including Bombay phenotype) is the most importance step.

KEYWORDS

Bombay blood group, lectin, donor registry

INTRODUCTION

Bombay blood group was first discovered by Dr. Bhende in 1952 in Bombay, India. In this phenotype there is no "A" or "B" antigens on red blood cells or in secretions, similar to O' blood group. But there is no expression H antigen (or Hs substances), which is present in blood group O.1 Bombay phenotype is due to inheritance of a double dose of the h gene, which create a rare genotype hh. As a result of this rare genotype ABO gene is not expressed, so no ABH antigens formed. Therefore red blood cells of these phenotype individuals not react with anti A, anti B, anti H and their serum contains anti A, anti B and anti H antibodies. In cell grouping Bombay blood group is often misdiagnosed as 'O', which can lead to fatal hemolytic transfusion reactions in recipient. Therefore serum grouping is necessary. Red blood cells normal blood group O individuals react with anti H lectins while those of Bombay blood group does not show any reactivity.2 There are more than 130 phenotypes of Bombay blood have been reported.3 Incidence of Bombay blood group in Southeast Asia is about 1/10, 000 and in Caucasian is 1/250, 000.4 The aim of the study was to detect the prevalence of Bombay phenotype in blood donors in Northern India.

MATERIALS AND METHODS

The study was conducted in Department of Transfusion Medicine, of a medical university of Lucknow, India from January 2016 to December 2018. Ethylenediaminetetraacetic(EDTA) whole blood samples routinely collected for blood grouping from all blood donors. Both cell and serum grouping were performed on all samples with the help of Qwalys 2 & Qwalys 3 (Diagast, France). Samples which show O blood group were further tested by conventional tube technique after washing the donor and reagent RBCs three times with 0.9% normal saline.[5,6]

For confirmation of Bombay blood group the samples were tested with commercial anti-H lectin (Tulip Diagnostics, India). We use tube method, in this one drop of anti-H lectin mix with one drop of 5% red cell (washed with 0.9 % normal saline) suspension then centrifuged and checked for agglutination.[5]

Inhibition test was performed to check the secretory status of these Bombay blood groups. Fresh saliva was collected from the blood donors, after collection saliva was boiled, centrifuged, and the supernatant used for testing according to AABB and DGHS Technical Manual.5,6,7 Adsorption Elution Technique was to rule out para Bombay phenotype. History of Consanguinity among parents was also recorded.

RESULTS

Total 177,888 whole blood donors were tested for blood grouping in the study period. Total 06 cases (i.e. 0.0034%) of Bombay blood group phenotype were detected as no para Bombay phenotype was detected in Absorption elution technique. Out of 06 Bombay blood group phenotype, 05 were male and 01 was female blood donor. All were Rh D positive. Saliva testing of all 06 cases showed agglutination, which confirms that they were nonsecretor of H antigen. (Table: 1)

Consanguinity among parents was observed in 02 cases (33.3%)

Table: 1. Serological reactions of Bombay blood group donors.

Cases	Age/ Sex	Anti A	Anti B	Anti AB	Anti H	Anti D	A Cell	B Cell	O Cell	Saliva testing		Blood group	History of Consanguinity in parents
										Result	Interpretation		
Donor 1	40/ Male	0	0	0	0	4+	3+	4+	3+	2+	Nonsecretor of H	Oh Positive	No
Donor 2	42/ Male	0	0	0	0	4+	4+	4+	4+	2+	Nonsecretor of H	Oh Positive	Yes
Donor 3	38/ Male	0	0	0	0	4+	3+	4+	4+	2+	Nonsecretor of H	Oh Positive	No
Donor 4	30/ Female	0	0	0	0	4+	4+	4+	4+	2+	Nonsecretor of H	Oh Positive	No

Donor 5	35/ Male	0	0	0	0	4+	4+	3+	4+	2+	Nonsecretor of H	Oh Positive	No
Donor 6	28/ Male	0	0	0	0	4+	4+	4+	4+	2+	Nonsecretor of H	Oh Positive	Yes

DISCUSSION

The Bombay blood group is rare, also known as Oh blood group. It is characterized by absence of A, B and H antigens on red blood cells. Serum of these phenotypes has anti A and Anti B antibodies. But the serum also agglutinates with blood group O red blood cells because of the presence of highly reactive antibody known as ant H antibodies.[4]

The Bombay blood group phenotype is due to inheritance of two recessive h genes. The H antigen which is precursor of A and B antigen is synthesized by H gene (FUT1).1 Mutation in H gene lead to formation of h gene. Because of this mutation inactivated enzyme is formed which is required in production of H antigen.4,8 Blood group A and B formed when N-acetyl-galactosamine and galactose binds to H substance respectively. Blood group O is when none of these binds.[9]

Bombay blood group individuals do not have H antigen, therefore they cannot synthesize blood group A and B antigens.4 Therefore, no ABH antigen present on red blood cells and in body secretions of Bombay blood group individuals.[10]

Prevalence of Bombay blood group in general population is 1 in 10,000 individuals in India and 1/1,000,000 individuals in Europe.11 It is rare in Caucasian with incidence of 1 in 250,000.[4]

Prevalence varies in various region of India. In this study prevalence of Bombay blood group was 0.0034% in blood donor population. Prevalence among blood donors in other states such as Southern Bengal, Tamil Nadu, Karnataka and Andhra Pradesh is 0.00712, 0.00413, 0.005%14, and 0.05%15 respectively.

Prevalence is higher in Andhra Pradesh as compared to the other parts of India. This is probably because of consanguinity among parents. The author found 77% cases had history of consanguineous marriage among parents15, while in this study 02 cases (33.3%) had such history.

In western states of India its incidence is high. Gorakshakar et al. found 1 in 4500 incidence in rural population of Maharashtra16. Bhatia and Sathe found incidence 1 in 7600 in the urban population of Mumbai17.

CONCLUSION

Bombay blood group is a rare blood group. If serum grouping is not performed, it is misdiagnosed as blood group O. If these people transfuse with blood group O, serious acute hemolytic transfusion reaction can occur. Therefore both forward and reverse blood grouping should be done. In suspected cases anti H lectin should be used for confirmation.

Bombay blood group phenotype individuals are advised not to give blood in routine blood donation camps because if there is no demand then this blood will expire1. In emergency situation, it is very difficult to supply Bombay phenotype. Therefore maintaining a rare donor registry is the most importance step. In elective surgeries autologous blood donation can be considered.

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