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# Bombay Blood Group: An Overview

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**Abstract:** The Bombay Blood Group is rare blood group with absence or deficiency of H antigen. This is first reported in Bombay (Mumbai) 1952. Named for the city in which it was first discovered. It is a blood group which shows absence of A, B, H antigens on red cells and presence of anti-A, anti-B and anti-H antibodies in serum. The H antigen is located on the surface of red blood cells and is the precursor of A and B antigens. H antigen can be synthesized by H gene FUT1 and FUT2 which is located on chromosome 19 and give rise to glycosyl transferase that add 1-fucose to a precursor substance to produce H antigen on red cells. Bombay group would be categorized as O group because they wouldn't show any reaction to anti-A and anti-B antibodies just like a normal O group. When a cross matching is done then it would show cross-reactivity or incompatibility. The reverse or serum grouping has to be performed to detect the Bombay blood group.

## INTRODUCTION

Bombay blood phenotype was first discovered in Bombay in India by Dr. Y.M. Bhende in 1952. Named for the city in which it was first discovered. It describes individuals whose RBC's lack the H antigen, also known as Oh group.

## DISCOVERY

In 1952, Dr Bhende along with his co-authors published a paper on a new blood group the Bombay blood group. This was based on their research work over the previous few months.

In December 1951, a patient had been admitted to K.E.M. hospital after a railway accident. He was found to be O-Positive but on cross-matching his serum agglutinated all O group cells. Plasma was transfused. [1]

Both the Bombay and Para-Bombay phenotype are the result of point mutation in the FUT1 gene which results in the formation of complete H deficient phenotype or partial H deficient phenotype. These two rare phenotype naturally develop anti H antibodies that cause problems in pre transfusion testing. [2]

The Blood Group is characterised by absence of normal ABH antigens and have co-responding antibodies in serum. This blood group is suspected when reagent O cells show agglutination in reverse or back typing or during antibody screening. The Bombay phenotype which was initially mistyped as O group. [3]

The blood group A means antigen of type A and antibody of type B in blood. In AB both antigen A and B and no antibodies. In O only antibodies A and B no antigen present. Instead of these blood groups the antigen H and antibodies H present and no other blood can given to it is called Bombay blood group. They can receive only from transfusion with Bombay blood type. [4]

Bombay blood group, known as Oh (or) H/H blood group is the rare blood type. The Bombay group (HH) results from the inheritance of two rare recessive h genes which occur at a locus other than the ABO gene locus. The H antigen is the precursor for the formation of A and B

antigens and its absence is termed as H antigen deficient phenotype. It results in, Bombay or Para-Bombay blood group in an individual. [5]

It is a blood group which shows absence of A, B, H antigens on red cells and presence of anti-A, anti-B and anti-H antibodies in serum. The H antigen is located on the surface of red blood cells and is the precursor of A and B antigens. H antigen can be synthesized by H gene (FUT1) and (FUT2) which is located on chromosome 19 and give rise to glycosyl transferase that add 1-fucose to a precursor substance to produce H antigen on red cells.

A patient with Bombay blood group should be transfused only with same group. [6]

Bombay blood group is the rare phenotype and it can be mistaken as O. So proper testing is required to detect Bombay phenotype. Basic test with Anti H lectin confirms the absence of H antigen and reverse grouping with O cell confirms the presence of Anti H in the patient plasma. Patient should be aware of Bombay phenotype and sufficient number of units should be reserved prior to the surgery as there is no alternative red cell transfusion in O Bombay phenotype. In emergency if there is any delay in obtaining Bombay phenotype units, patient should be supported only with the plasma or plasma expander. Never to transfuse the patient with O blood group as it contains higher number of H antigen which leads to acute transfusion reaction.

## PROPERTIES OF BOMBAY BLOOD GROUP [7]

1. Absence of H, A and B antigens; NO agglutination with anti-A, anti-B, or anti-H lectin.
2. Presence of anti-A, anti-B, anti-AB and potent wide thermal range anti-H in the serum.
3. A, B, H non-secretor (no A, B, or H substances present in saliva).
4. Absence of H enzyme in serum and H antigen on red cells.
5. Presence of A or B enzymes in serum and red cells.
6. A recessive mode of inheritance.
7. Red cells of the Bombay group are compatible only with the serum from another Bombay individual.

Individuals with Bombay blood group can donate to all ABO blood group people and can only accept from Bombay blood group people. The Bombay anti-H is an IgM antibody that can bind complement and cause red cell lysis. Because the H antigen is common to all ABO blood group, Bombay

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Table 1: Blood Group and There Interaction

| Blood Group | Antigen on RBC            | Antibody in Serum                                | Compatible with Blood Group | Incompatible with Blood Group |
|-------------|---------------------------|--|-----------------------------|-------------------------------|
| A           | A                         | Anti-B   | A, O                        | B, AB                         |
| B           | B                         | Anti-A   | B, O                        | A, AB                         |
| AB          | A and B                   | Neither anti A nor B                             | A, B, AB, O                 | NILL                          |
| O           | Neither A nor B           | Anti A and B                                     | O                           | A, B, AB                      |
| HH          | absence of A, B, antigens | presence of anti-A, anti-B and anti-H antibodies | HH                          | A, B, AB, O                   |

blood is incompatible with all ABO donors. People having this blood group are very small in number. It doesn't mean that these people are having any disease or it's the symptom of any disease. People with Bombay blood group should report to the nearest blood bank. They are advised not to give blood in donation programs because it is not necessary that these Bombay blood will be used within 45 days. Relatives can have Bombay blood group, so they should be screened for Bombay blood group. [8, 9]

Given that this condition is very rare, any person with this blood group who needs an urgent blood transfusion will probably be unable to get it, as no blood bank would have any stock. Those anticipating the need for blood transfusion (e.g. in scheduled surgery) may bank blood for their own use (i.e. an autologous blood donation), but this option is not available in case of accidental injury. [9, 10]

## CONCLUSION

The Bombay blood group is a very rare blood group discovered almost 60 years back. The Bombay blood group detection requires proper blood grouping and cross matching of the blood samples. This group would be categorized as the "O" group as it does not show any reaction to anti-A and anti-B antibodies just like normal 'O' group. When cross matching with 'O' group is done, then it would show cross reactivity or incompatibility. Therefore reverse grouping or serum grouping has to be done to detect this group.

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