Case Report

An elderly patient with a rare blood group in Bangladesh: a case report

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ABSTRACT

The Bombay Blood Group is a rare blood type characterized by the absence or deficiency of the H antigen. It was first identified in Mumbai (formerly Bombay) in 1952, thus it was named as. This blood group lacks the A, B, and H antigens on red blood cells, and its serum contains anti-A, anti-B, and anti-H antibodies. A 60-year-old male was admitted to BIRDEM General Hospital with uncontrolled diabetes mellitus, hypertension, right-sided pneumonia, chronic kidney disease and severe anemia. Due to his critically low hemoglobin level of 6.5 gm/dl, he required two units of packed red cells. During pre-transfusion testing, a blood sample was taken and sent to our Transfusion Medicine Department. At the time of blood grouping we surprisingly noticed that he has 'Bombay Blood Group'. It is a very rare type of blood group and on routine blood grouping behaves as "O" unless reverse grouping or serum grouping has been done but can receive transfusion from only peoples having Bombay group. Interestingly, individuals with the Bombay phenotype are likely to have family members with the same blood group. His three sons and one daughter were tested for blood grouping, all showed "O" positive with Rhesus "D" positive. Despite no known family members or records in our blood bank having the Bombay blood group, his sons embarked on a search for Bombay phenotype donors for his transfusion. They succeeded in locating two donors with the Bombay blood group, one from Narayanganj and another from Chandpur. Following treatment for infection and diabetes control, he received two units of Bombay red cell concentrate transfusion. After receiving blood transfusion, his clinical condition improved.

Key words: *Blood transfusion, Bombay blood group, H deficiency, red cell concentrate.*

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INTRODUCTION

The Bombay blood group is a genetically defined and immunologically separate subset of human erythrocytes that lacks the A, B and H antigens but have serum antibodies against all three of these antigens. It is known as the Bombay blood group and Dr. YM Bhende made the initial discovery of it in Bombay (which is now known as Mumbai) in 1952.[1]Worldwide, the Bombay and Para-Bombay phenotypes are extremely rare blood types. The frequency of both phenotypes, combinedly, is 1 in 10,000 individuals,[2]with the exception of the tribal population of Orissa, where the incidence has been

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reported as 1 in 7600.[3] This is where H deficiency was originally identified in India.[4] In many Indian states where consanguinity is customarily observed, the incidence is higher.[5]It happens in 1 in 1,000,000 times in Europe and 1 in 1000 times on a small French Reunion island in the Indian Ocean.[2,5]In Bangladesh, H-deficient Bombay phenotypes are similarly quite uncommon. In 1990, the first example was documented, including three sisters belonging to the Miah family who possessed the 'Bombay' phenotype.[6] In 2010, a 35-year-old woman was diagnosed with pancreatic cancer, underwent a Whipple procedure, and was undergoing chemotherapy. As part of her routine preoperative checkup, a blood group test was conducted, and it unexpectedly revealed that she had the Bombay blood group.[3] An individual with the Bombay phenotype can only receive blood from another Bombay individual[7]and they are unable to donate blood to anyone of the ABO group.[8]Given the rarity of the Bombay blood group, the aim of this case report is to add to the sparse existing literature while addressing the challenges associated with this condition.

CASE REPORT

A 60-year-old male presented with uncontrolled diabetes mellitus, hypertension, right sided pneumonia, chronic kidney disease and severe anaemia. The patient was advised to transfuse two units of red cell concentrate (RCC) to correct his anemia (hemoglobin was 6.5 gm/dl). As blood sample was sent for pre transfusion testing to Transfusion Medicine Department in BIRDEM General Hospital, patient's ABO and Rhesus blood grouping was done in both slide and test tube methods. It was similar to the "O" blood group, there was no agglutination with anti-A, anti-B, and anti-AB in the forward grouping. Interestingly, agglutination was not only seen in reverse typing with 'A', 'B', but also with "O" control cells, with an atypical strong 4+ response at a temperature range of 4 to 37 °C, which is strongly common for the Bombay phenotype. Thus, in both the slide and tube methods, there was a discrepancy between forward and reverse typing. The patient's blood group type was most likely Bombay blood phenotype. The subsequent tests, such as the Saliva Inhibition Test and Anti-H lectin test, were also carried out for confirmation of Bombay phenotype. Patient's red cells tested with anti H lectin showed no agglutination which is similar to Bombay phenotype. On the other hand, saliva inhibition test result showed there were no A, B and H substances in the patient's saliva. A person with the Bombay phenotype has a higher chance of having both parents and children with same blood group. As a result we tested his three sons and one daughter's blood grouping but all were "O" Rhesus "D" positive. He had strong family history of gastrointestinal malignancy from his maternal side and there was no history of consanguineous marriage. Although he had a relative with Bombay blood group but due to severe illness she could not donate blood to him. Despite no other known family members or records in our blood bank having the Bombay Blood Group, his sons began a search for donors with the Bombay phenotype for his transfusion. They successfully managed two donors with the Bombay blood group, one from Narayanganj and another from Chandpur. Subsequently he got appropriate treatment along with two units of Bombay packed red cells. Afterwards his clinical condition showed improvement.

DISCUSSION

The ABO blood group system is classified as "A", "B", "AB" and "O", which is based on presence or absence of antigenic substances on the surface of red blood cells.[9] The alleles O, A, and B influence a child's blood type, which is influenced by both parents.[10]The expression of A and B antigens are determined by the H and Se genes, which both give rise to glycosyltransferase that add L-fucose, producing the H antigen on red cells.[1]The H genes (FUTl) and (FUT2), which are found on chromosome 19, produce the H antigen.[10]The plasma of Bombay phenotype individual carries potent wide thermal anti-H and anti-A, anti-B and anti-AB antibodies, yet their red blood cells and secretions lack H enzymes and H, A and B antigens.[4]Bombay blood group may be classified as "O" group during cell grouping or forward grouping but cross-matching shows incompatibility with "O" blood group.[11] For detection of Bombay phenotype, the standard forward grouping and reverse grouping with "O" control cells are very important in both slide and test tube method. The use of Anti-H lectin along with salivary secretor status detection are also crucial for diagnosis due to their non-secretor nature.[6]These type of basic tests can prevent a patient from haemolytic transfusion reaction. An individual with the Bombay phenotype can either receive autologous donation or

blood from an individual of Bombay phenotype; no other ABO blood type will match in case of an emergency blood transfusion.[5,10] Apart from the necessity for Bombay blood transfusions, there are no other adverse effects of being deficient in the H antigen.[11]Top of Form

Bottom of Form

Due to its rarity, the Bombay phenotype poses a significant challenge in finding a compatible blood donor. However, using online rare blood donor registries can make it easier. The Transfusion Medicine Department can play a significant role by maintaining comprehensive registers of rare blood donors both in hard copy or in digital platform.

In conclusion, being a rare phenotype, proper forward and reverse grouping is crucial for detection of Bombay blood group from the "O" phenotype. Daily life of these people are usually unaffected except during blood transfusions while elective cases may benefit from autologous transfusions. However, emergencies pose challenges due to donor scarcity. Maintaining registries of rare blood types and facilitating exchange programs is crucial. Furthermore, cryopreservations of rare blood groups play a life saving role for them in need of blood transfusion.

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