

## Bombay blood group - the rarest blood group in the world

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On 21 May 2016, Kamruzzaman a 25 years old man who worked in a Plastic Industry was severely injured in a traffic accident. He was admitted in to Apollo Hospital, Dhaka with multiple fractures (one hand and one leg were broken) and displacement of his pelvis. His haemoglobin level dropped to 5.6 grams per deciliter and he required immediate Orthopaedic surgery. In this situation urgent blood transfusion was needed and doctors found that his blood group was incompatible with most common types. Later on Bangabandhu Sheikh Mujib Medical University, Dhaka discovered that Kamruzzaman had the rare Bombay blood group.

The hospital decided to test his family members and found his sister having the same group. But she was not fit to donate. The Plastic Industry authority searched up and down the Dhaka city and called up uncountable number of hospitals and blood banks, but most had never heard of this blood group, even leading blood banks in Bangladesh were unaware of. They tried to find a match in some 50 donors in Bangladesh but all their efforts went in vain. Then a frantic online and offline search led them to connect Think Foundation, a Mumbai-based NGO. They found in India, where a robust blood distribution network exists, less than only 400 people are known to have the Bombay blood group and a few of whom were traceable donors.

It was very difficult to export the blood from India to our contry. Therefore it had been an uphill task for the Think Foundation to seek permissions from multiple authorities and finally got approvals from the State Blood Transfusion Council, Central Drugs Standard Control Organisation, Directorate of Health Services and Central Industrial Security Force to allow the export of blood (which is only permitted under special circumstances) to Bangladesh. Ultimately four units of the rare Bombay blood group blood was flown across the border and the Bangladeshi youth undergone in to a life-saving surgery. Swapna Sawant, Krishnanand Kori, Mehul Bhelekar and Pravin Shinde

had donated the blood to save Kamruzzaman. This endeavour proves that humanity is stronger than the border differences.<sup>1,2</sup>

Recently due to this incidence Bombay blood group has come on to the table discussion of the health professionals and as well as the general people, that they had never heard of this particular blood group. It's true most of us are not aware of Bombay blood group's existence. Bombay blood group is named so because the first case was found in Bombay (now Mumbai), India.<sup>3</sup>

Dr. Durgadas Kasbekar of CDFD Hyderabad has written a detailed article about it in the "Indian Journal of History of Science" that in 1952 Dr. Y.M. Bhende, C.K. Deshpande and H.M. Bhatia of the Seth Gordhandas Sunderdas Medical College, Bombay published a note in The Lancet about two patients (X, a railway worker and Y, a stab wound victim) who needed blood transfusion.<sup>3</sup> None of the ABO blood types (known until then) worked for them. The moment their blood samples were mixed with any of the above types, the blood coagulated or clumped up. The doctors tried the blood of over 160 donors and found at last that one from Mr. Z, a resident of Bombay, suited the type of both patients X and Y. This donor blood type was then named by Dr. Bhende and others as the 'Bombay Blood Type.'<sup>3</sup> Scientifically it is now termed the (hh) type of blood.

Bombay blood group is one of the rarest blood groups in the world. 1 in every 17600 people in India or 1 in every 25000 people in the world has this blood group.<sup>4</sup> The frequency is more in India with respect to the world. It is believed that this blood group resulted from gene mutation in Indian population and slowly was spread all over the world. Mumbai has got only 35-40 blood donors with this blood group.<sup>5</sup> A very few people (till now only 179) are known to have Bombay Blood group in India.<sup>6</sup>

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Most places where blood grouping is done, the presence and absence of AB and Rh alone is tested in the blood. Since Bombay group does not have neither A nor B antigens, it is usually read as "O" group and many times not identified at all, because of lack of necessary technology in blood banks.

If someone has blood group A, it means that the person has antigen of type 'A' and antibody of type 'B' in his/her blood. People with AB have both antigen A and B in their blood and no antibodies. People with O blood group have only antibodies A and B and no antigens. However what is not generally known is that all these groups have an antigen H in the blood as well. H antigen is present on 99.9% of RBC's in all population. Therefore a very few people do not have this antigen H in their blood. Instead they have naturally occurring antibody H, they are people with Bombay blood group. Bombay blood group differs from O blood group by lacking H antigen on RBCs. It could be Rh positive or Rh negative.<sup>7</sup> For this reason people who have Bombay phenotype can donate red blood cells to any member of the ABO blood group system (unless some other blood factor gene, such as Rhesus, is incompatible), but they cannot receive blood from any member of the ABO blood group system (which always contains one or more of A and B and H antigens), but only from other people who have Bombay phenotype. A transfusion of normal group "O" blood can trigger a severe transfusion reaction. Anti H can activate the complement cascade which lyses RBCs in circulation (intravascular haemolysis).

#### Blood Groups (Antigens and Antibodies)

Blood Group	Antigens	Antibodies
<b>A</b>	A,H	B
<b>B</b>	B,H	A
<b>AB</b>	A,B,H	Absent
<b>O</b>	H	A,B
<b>Bombay Blood Group</b>	Absent	A,B,H

One can differentiate O and Bombay Blood group only when a specific test for H antigen is done. The most simple way to detect Bombay blood group is to perform both forward and reverse typing (both of which will show the same results for a Bombay blood type as one would expect for type O), followed by reverse typing with control type O cells. The patient's serum or plasma will agglutinate all type O cells except his own. This is a simplified explanation of the process.<sup>8</sup>

In Bangladesh first documented Bombay blood group was found among three sisters of a same family (MIAH FAMILY) in 1990.<sup>9</sup> In 2007 another 60 year old male patient was found in the Transfusion Medicine Department of BIRDEM, Dhaka.<sup>10</sup> In 2010 A 35 years old lady was admitted to Square Hospital for termination of pregnancy on a medico-legal background. She was a diagnosed case of carcinoma of pancreas with Whipple's operation performed six months back and was on chemotherapy. During pre-operative check-up, it was discovered that she had 'Bombay Blood Group'.<sup>11</sup> In Bangladesh till 2011 only nine people with Bombay blood group had been formally reported by the Transfusion Medicine Department of BSMMU.<sup>12</sup> Recently Kamruzzaman and his sister was detected as Bombay blood group in Bangladesh.

As Bombay blood group 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 in stock. However to certain extent it is possible to avoid such emergency to arise. We should all know our own blood group and in case it's found to be O group make sure it's not

Bombay blood group. One can do this by getting their blood grouping done in known standard hospital or blood bank. A person with this rare group should always be cautious and alert. Check blood group of all the family members and relatives of that person. It's very likely that one or the other relative has this group. Once someone is aware of his blood group to be Bombay Group, immediately register himself with Bombay Blood group Network at <http://www.bombaybloodgroup.org/user/register>. It will help him in need.

Finally, this is the time to make a robust network for blood distribution in Bangladesh. Needs of which was not only felt in every case of Bombay blood group patient but all other cases who required blood transfusion. According to WHO, blood donation by 1 percent of the population can meet a nation's most basic requirements for blood. For our hugely populated country it is not a difficult task if we can aware mass people about it. Hope we be able to do this successfully in near future.

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