

CASE STUDY

INCIDENCE OF ABSENCE OF H ANTIGEN IN AN INDIVIDUAL IN CENTRAL INSTITUTE OF INDIA

RR Sinha¹, V Patil²

¹ JR3, Dept of Transfusion Medicine & Blood bank, AIIMS Bhopal

² Assistant Professor, Dept of Transfusion Medicine & Blood bank, AIIMS Bhopal

Received: 13 Sep, 2022/Revision: 16 Nov, 2022 /Accepted: 30 Nov, 2022

Abstract: Bombay blood group is a rare blood group in which there is the absence of H antigen and presence of anti-H antibodies. At the time of blood grouping, this blood group mimics O blood group due to the absence of H antigen, but it shows incompatibility with O group blood during cross matching. Serum grouping or reverse grouping are essential for confirmation of the diagnosis. Patients carrying this blood group can receive blood only from a person with this blood group. Reported cases of General surgery department with Bombay blood group. The transfusion support of such cases is still a challenge in the country like India where prevalence of Bombay blood group is extremely rare and due to which individual having this Bombay group faces difficulty at times of need.

KEYWORDS: Bombay Blood Group, Rare Blood Group, Interaction of the Hh and ABO genes

INTRODUCTION:

Bombay blood group is a rare blood group with the incidence of about 1 in 10,000 in India and 1 in 10⁶ in Europe.^[1] It was first detected by Dr. Bhende in Bombay, India in 1952.^[2] It occurs due to point mutation of the H gene. If the patient carries two mutant gene (H gene), then it will result in Bombay or Oh phenotype. The mutant variety is known as h gene, which does not code for any protein. Thus, there is a lack of production of the protein named fucosyl transferase, coded by H gene. This protein catalyzes the addition of L-fucose to the precursor chain to form the H antigen.

Thus, in patients with Bombay blood group, H antigen cannot be produced due to the absence of this protein. Normally, A and B gene specified products cause addition of N-acetyl galactosamine and D-galactose to the H antigen to form A and B antigens respectively. In the absence of H antigen, these reactions cannot take place. So, A and B antigens are not produced even if there is the presence of A and B gene. These persons are lacking A, B and H antigens in their blood, and consequently they produce anti-A, anti-B and anti-H antibodies. Absence of A and B antigens mimic O blood group.

Corresponding Author:
Dr Rishi Raj Sinha:
JR3, Dept of Transfusion Medicine & Blood bank,
AIIMS Bhopal 462024.



But, the presence of anti-H antibody causes cross reaction with all blood types including O group blood which carry H antigen. Hence, these patients can receive blood only from a person carrying Bombay blood group to avoid mismatched blood transfusion. There is another similar type of rare blood group known as para-Bombay in which there is a deficiency of H antigen, which can be diagnosed by reactivity with lectin *Ulex europaeus*. The person carrying this blood group also produces anti-H antibodies and show incompatibility with O blood group.

CASE REPORT:

62-year-old male with weight of 68 kg, Height 160 cm was admitted in General Surgery Ward for the operation for Carcinoma rectum. As in case of every patient, his sample came to blood bank for processing of Blood group. The findings of Blood group were noted and proceeded for Saliva testing.

Result Interpretation (Conventional Tube Method):

Table.1 Result Interpretation (conventional tube)

Anti A	Anti B	Anti D	Anti H	A cell	B cell	O cell	Result	ICT	DCT	ICT(AHG)
Neg	Neg	4+	Neg	4+	4+	4+	Suspect of Bombay Blood group.	4+	Neg	4+



Figure.1 Result Interpretation (conventional tube)

- A) 1 time blood group done by new batch of Anti H.
- B) 1 time blood group done by new set of freshly prepared Pooled cells.
- C) New fresh sample also tested with same result.
- D) O cell incubated at room temperature for 15-20 min to see the reaction but it came as 3+.

On Saliva testing:

Table.1 On saliva testing

C1	C2	C4	C8	T1	T2	T4	T8
4+	4+	4+	3+	4+	4+	4+	3+

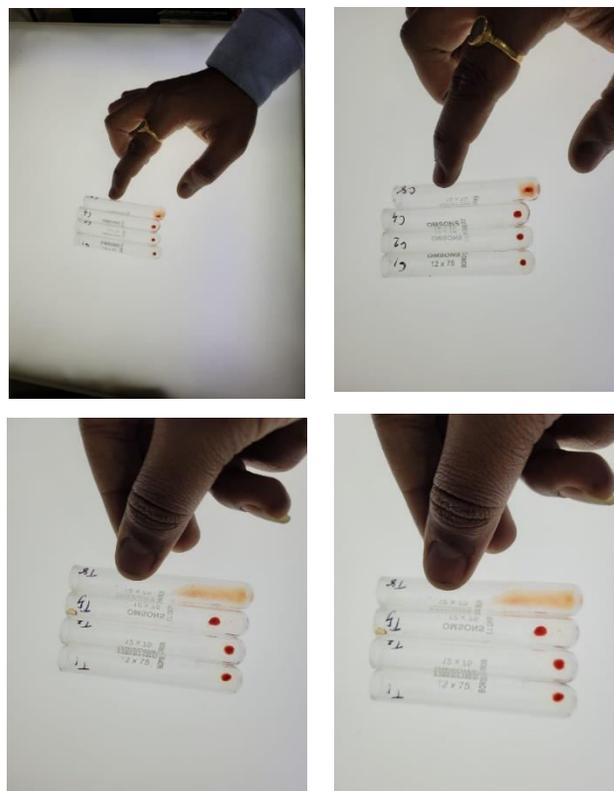


Figure.2 On saliva testing

Furthermore, the following patient history was taken.

- 1) History of complaint of blood mixed with loose stools in the last 4 months.
- 2) History of loss of weight of 5 kg since last 4 months.
- 3) History of loss of appetite.
- 4) No comorbidities.
- 5) No history of blood transfusion in life.
- 6) No history of blood donation in life.
- 7) Rectal carcinoma?
- 8) Biopsy of report: Awaited.

The following family history were also taken to know the hereditary cause or if next generation is having the Bombay blood group.

- 1) Sample of Nephew taken (attendant with him currently in hospital): O positive (tube method).
- 2) Sample of her 2 daughters was planned but both of them was outside station hence we were not able to take the samples but according to nephew, daughter's blood group was not Bombay blood group.

DISCUSSION:

Bombay blood group occurs due to point mutation of H gene. The mutant variety is known as h gene, which does not code for any protein. Thus, there is a lack of production of the protein named fructosyltransferase, coded by H gene. This protein catalyses the addition of L-fucose to the precursor chain to form the H antigen. Thus, in patients with Bombay blood group, H antigen cannot be produced due to the absence of this protein. Normally, A and B gene specified products cause addition of N-acetyl galactosamine and D-galactose to the H antigen to form A and B antigens respectively. In the absence of H antigen, these reactions cannot take place. So, A and B antigens are not produced even if there is the presence of A and B gene. These persons are lacking A, B and H antigens in their blood, and consequently they produce anti-A, anti-B and anti-H antibodies. Absence of A and B antigens mimic O blood group. But, the presence of anti-H antibody causes cross reaction with all blood types including O group blood which carry H antigen. Hence, these patients can

receive blood only from a person carrying Bombay blood group to avoid mismatched blood transfusion.^[3]

The main transfusion related challenge in the patients with Bombay blood group is the arrangement of cross-matched blood due to very low incidence of this blood group in the population. A few cases have been reported where blood was arranged with difficulty from the neighboring states after few hours for transfusion in the emergency situation.^[4,5] However, any fresh frozen plasma (FFP), platelets and cryoprecipitate can safely be transfused in these patients. One patient with hemodynamic instability and coagulopathy was managed with intraoperative crystalloid and colloid infusion as crossmatched blood was unavailable.^[6] Coagulopathy was treated by transfusing six units of FFP. A few cases of transfusion reaction have been reported following transfusion of O group blood in patients with Bombay blood group.^[7,8] Autologous blood transfusion is another suitable option in these patients to avoid problems associated with the arrangement of blood from healthy donors.

Conclusively, it can be stated that before blood transfusion, only grouping is not sufficient. Cross matching is essential to identify this rare blood group. Reverse grouping or serum grouping should be performed to confirm the diagnosis. First degree relatives of the patient carrying Bombay blood group should be tested for the presence of this group as we had done in our case, and the patient should carry an identity card mentioning the blood group for an emergency situation which was not there in our case as our patient never had history of blood transfusion in his life. Moreover, maintenance of rare blood group registry and cryopreservation techniques is essential for easy and fast arrangement of blood.

CONCLUSION:

Conventional Tube Method with Reverse grouping or serum grouping should be performed along with Saliva testing to confirm the diagnosis of Bombay Blood Group.

Advice:

- 1) First degree relatives of the patient carrying Bombay blood group should be tested for the presence of this group.
- 2) The patient should carry an identity card mentioning the blood group for an emergency situation.

Acknowledgement:

I would like to thank Residents of Dept of Transfusion Medicine, AIIMS Bhopal, my seniors who helped us knowing in short, the details of this procedure. I would like to thank the technicians of Dept of Transfusion Medicine & Blood Bank, AIIMS Bhopal who helped us in getting test done and discussion too.

REFERENCE:

- [1]. Balgir RS. Detection of a rare blood group 'Bombay (Oh) phenotype' among the Kutia Kondh primitive tribe of Orissa, India. *Int J Hum Genet.* 2005; 5:193–8.
- [2]. Bhende YM, Deshpande CK, Bhatia HM, Sanger R, Race RR, Morgan WT. A "new" blood group character related to the ABO system. *Lancet.* 1952; 1:903–4.
- [3]. Khan MQ. Bombay blood group: A case report. *Pac J Sci Technol.* 2009; 10:333–7.
- [4]. Das S, Harendra KM, Anand R. Bombay blood a rare entity. *J Clin Biomed Sci.* 2011; 1:122–5.
- [5]. Ali MA, Sohaib M. Emergency dilatation and curettage in a patient with Bombay blood group. *J Coll Physicians Surg Pak.* 2014; 24:603–5.
- [6]. Shahshahani HJ, Vahidfar MR, Khodaie SA. Transfusion reaction in a case with the rare Bombay blood group. *Asian J Transfus Sci.* 2013; 7:86–7.
- [7]. Malhotra S, Dhawan HK, Jain A, Sachdev S, Marwaha N. Acute hemolytic transfusion reaction in a patient with Bombay phenotype: Implications for ABO grouping. *Indian J Hematol Blood Transfus.* 2014; 30:108–10.
- [8]. Balgir RS. Detection of a rare blood group 'Bombay (Oh) phenotype' among the Kutia Kondh primitive tribe of Orissa, India. *Int J Hum Genet.* 2005; 5:193–8.
- [9]. Bhende YM, Deshpande CK, Bhatia HM, Sanger R, Race RR, Morgan WT. A "new" blood group character related to the ABO system. *Lancet.* 1952; 1:903–4.
- [10]. Principles & Practice of Transfusion Medicine 2nd Edition 2018 RN Makroo.
- [11]. Denise M Harmening modern blood banking & transfusion practice, 6th ed.
- [12]. Rossi's principle of transfusion medicine, 5th edition.
- [13]. DGHS Manual.

Cite of article: Sinha R, Patil V. Incidence of absence of H antigen in an individual central institute of India. *Int. J. Med. Lab. Res.* 2022; 7,3:33-36.

<http://doi.org/10.35503/IJMLR.2022.7305>

CONFLICT OF INTEREST: Authors declared no conflict of interest

SOURCE OF FINANCIAL SUPPORT: Nil

International Journal of Medical Laboratory Research (IJMLR) - Open Access Policy

Authors/Contributors are responsible for originality of contents, true references, and ethical issues.

IJMLR publishes all articles under Creative Commons Attribution- Non-Commercial 4.0 International License (CC BY-NC). <https://creativecommons.org/licenses/by-nc/4.0/legalcode>