Brief Report

A profile of rare bloods in India and its impact in blood transfusion service

Sanmukh R. Joshi, K. Vasantha[1]

Institute of Health Sciences, Muscat, Oman, [1]National Institute of Immunohaematology, Mumbai, India

Abstract:

From transfusion point of view, a rare blood is the one which lacks a high-frequency antigen as well as the one who lacks multiple common antigens and such blood donations help in transfusion to those recipients having alloantibodies to corresponding antigens. In India, we have about four such kinds of phenotypes potential enough to pose problems in providing blood to the recipients having these phenotypes. Besides, there are other four kinds of rare bloods that pose seldom problems in blood supply, though some of these may cause problems in interpretation of results on assigning proper blood groups for a person.

Key words:

Impact in transfusion service, India, rare blood

Access this article online

Website: www.ajts.org

DOI: 10.4103/0973-6247.95050

Quick Response Code:

Correspondence to:
Dr. Sanmukh R. Joshi,
Advanced Medical & Dental Institute (IPPT), Universiti Sains Malaysia, No: 6, Tingkat 1, Lot 13; Persiaran Seksyen 4/9, Bandar Putra Bertam, 13200 Kepala Batas, Pulau Penang,Malaysia.
E-mail: sanmukhj@yahoo.com

A rare blood is the one that, on the basis of the blood group characteristics, is found in a frequency of 1 : 1000 random samples in a given population.[1] From blood transfusion point of view, a rare blood is the one with red cells lacking a high-frequency blood group antigen.[1] Besides, a blood that lacks multiple common antigens may also be considered as a rare[1] since such donor's blood may be useful for the transfusion recipient who has developed multiple antibodies to corresponding antigen. Rare nature of a blood type may vary from one country to another and therefore a blood type rare in one country may not be considered rare in another. The following rare bloods we have encountered over a period in India:

- "Bombay" (Oh) phenotype
- - D -/- D -
- In(a+b-)
- Co(a-b-)
- A host of weaker variants of A, B and H antigens
- I-i-
- CdE/CdE ($r^y r^y$)
- Mg

Of these, the "Bombay" (Oh) phenotype is found in the length and breadth of the country. At one point of time, when such a survey was reported,[2] there were a total of 169 cases listed of this phenotype of which 127 came from the West, 30 came from the South, nine from the North, and three from the East of the country. In Mumbai, its incidence was found to be 1 : 7600. Its occurrence was found to be 1 : 2500 in the South-West part in Maharashtra State of India among the Maratha population.[3] It is the most frequently asked rare blood in our set up. We detect 10 cases every year at our reference center at the National Institute of Immunohaematology of Indian Council of Medical Research. The donor : patient ratio being 1 : 4, it becomes difficult to meet the demand and supply ratio. There were three individuals having this rare group with Rh.D negative status of which one of the subjects was to undergo cardiac-by-pass surgery that required a massive transfusion regiment. It was a real challenge, but its demand was met through allogenic and autologous blood donation as the patient's hematocrit level was excellent. A thalassemic patient with this rare phenotype, living in interior state of Maharashtra, was finding it difficult to get blood for her regular transfusion schedules.

The rare -D-/-D- phenotype of the Rh blood groups lacks the Rh17 (all Rh antigens except D) that makes it a high-frequency antigen-negative blood. This phenotype has been encountered in some four patients. One of the cases was associated with hemolytic disease of the newborn (HDN),[4] the mother being immunized against Rh17 antigen. Her severely anemic baby was transfused with the mother's red cells, but the baby succumbed to her underlying disease. The second case with this phenotype was youth who met with vehicular accident and was transfused with about 12 units of Rh.D-positive blood. His -D-/-D- status was only recognized when cross match test revealed a presence of anti-Rh17 on later dates. The third case with -D-/-D- phenotype was a pregnant woman who underwent a termination of pregnancy due to the hydrops fetus. Alloantibody in her serum, causing problem in cross match test that lead to identification of her phenotype as -D-/-D-.[5] The fourth case was a multi-transfused cancer patient showing incompatibility in cross match test due to anti-Rh17.

In(a+b-) phenotype was found in an Indian woman suffering from an intestinal cancer.[6] She experienced a very severe transfusion reaction to an apparently incompatible blood. She had a very high titer alloantibody that showed a remarkable prozone phenomenon and probably because of that, an incompatibility was missed during the pre-transfusion cross match test on her blood. The antibody specificity was identified as anti-In^b and her red cells were typed as In(a+b-). She was pregnant twice some 15 years back and had two children. She might have been immunized during pregnancies but sustained antibody level of this magnitude showing prozone effect may presumably be due to a constant stimulus through her underlying cancer as CD44 antigen is known to be a tumor antigen,[7] and that In^a/In^b are on CD44 molecules.[8] More than 2 000 blood units were screened to find two compatible units for transfusion. One more unit donated by her brother was compatible with her serum.

Colton-null phenotype, also written as Co(a-b-), is an ultra-rare phenotype as there were only six other cases recognized till date. This phenotype was detected in an Indian woman, a primipara, second gravida who delivered a baby girl who developed a mild HDN.[9] Compatibility test revealed a high titer alloantibody, reacting with some high-frequency antigen, was identified as anti-Co3. Her red cells were typed as Co(a-b-). None of her family members were typed as Co(a-b-). The proband was a product of consanguineous marriage and community history was suggestive of a high rate of inbreeding; hence, such ultra-rare phenotype was emerged, we believe.

Among the reported weaker variants of the ABH antigens,[2] weak A is less infrequent than weak B, having a ratio of 3 : 1. Weak H, that give rise to weak A or weak B (as in para-Bombay) phenotype is much rarer than the "Bombay" (Oh) phenotype and occurs with a ratio of 1 : 15. The phenotypes with weaker ABH-antigens seldom pose problems in selection of blood unit for transfusion.

CdE/CdE (r^yr^y) phenotype of the Rh blood groups has been found only among the Parsi community[10] and has never posed any problem in transfusion management.

I-i- phenotype of the I-i blood groups was found to be a newly recognized entity among certain adults' red cells reacting as weak with anti-I as do the red cells from the newborn and reacting as weak with anti-i as do the red cells from an ordinary adult individual.[11] The phenotype was classified as i-i-. This phenotype was always found in an association with blood group A_1 and A_1B of the ABO blood groups and the red cells have a stronger expression of A_1 as defined by anti-A_1 (*Dolichos biflorous* lection).[12] The persons with this phenotype possess naturally occurring low-titer allo-anti-I, preferentially reacting at lower temperatures[11] and may cause nuisance in cross match test. This phenotype occurs in frequency of 1 : 1 000 in Mumbai population and has hardly caused any problem in transfusion practice.

The Mg is an ultra-rare antigen of the MNSs blood groups and was detected by chance in two individuals in Indian Population due to a contamination of potent anti-Mg present in an in-house preparation and use of ABO-blood grouping antisera.[13] A systematic search on 10 000 random donors revealed no further example of this antigen in our population. Although anti-Mg is a frequently found naturally occurring antibody, there is hardly any report implicating it as cross match problem or problem in supplying appropriate blood owing to its rarity.

References

1. Reesink HW, Engelfriet CP, Schennach H, Gassner C, Wendel S, Fontão-Wendel R, *et al*. Donors with a rare phenol (geno) type. Vox Sang 2008;95:236-53.
2. Bhatia HM, Sathe MS. Incidence of 'Bombay' (Oh) phenotype and weaker variants of A and B antigen in Bombay (India). Vox Sang 1974;27:524-32.
3. Sathe MS, Vasantha K, Mhaisalkar P, Gorakshakar AC. Distribution of Bombay (Oh) phenotypes in India. J Indian Anthropol Soc 1988;23:277-80.
4. Badakere SS, Bhatia HM. Haemolytic disease of the newborn in a rare -D-/-D- Indian woman. Vox Sang 1973;24:280.
5. Vasantha K, Seema J, Swati K, Dipika M. Fetal loss due to anti-Hro in a lady having rare genotype of Rh (D--/D--). Transfus Med 2005;15:78.
6. Joshi SR. Immediate haemolytic transfusion reaction due to anti-In^b. Vox Sang 1992;63:232-3.
7. Da Cunha CB, Oliveira C, Wen X, Gomes B, Sousa S, Suriano G, *et al*. *de novo* Expression of CD44 variants in sporadic and hereditary gastric cancer. Lab Investig 2010;90:1604-14.
8. Spring FA, Dalchau R, Daniels GL, Mallinson G, Judson PA, Parsons SF, *et al*. "The In^a and In^b blood group antigens are located on a glycoprotein of 80,000 MW (the CDw44 glycoprotein) whose expression is influenced by the In(Lu) gene". Immunology 1988;64:37-43.
9. Joshi SR, Wagner FF, Vasantha K, Panjwani SR, Flegel WA. An *AQP1 null* allele in an Indian woman with Co(a-b-) phenotype and high titer anti-Co3 associated with mild HDN. Transfusion 2001;41:1273-8.
10. Undevia JV, Sanghvi LD. The population genetics of the Parsis of Bombay (abstr). Int Congr Ser 1971;233:180.
11. Joshi SR, Bhatia HM. A new red cell phenotype I- i-: Red cells lacking both I and i antigens. Vox Sang 1979;36:34-8.
12. Joshi SR, Bhatia HM. I-i- phenotype in a large kindred Indian Family. Vox Sang 1984;46:157-60.
13. Joshi SR, Bharucha ZS, Sharma, RS, Bhatia HM. The Mg blood group antigen in two Indian families. Vox Sang 1972;22:478-80.

Cite this article as: Joshi SR, Vasantha K. A profile of rare bloods in India and its impact in blood transfusion service. Asian J Transfus Sci 2012;6:42-3.

Source of Support: Nil, **Conflict of Interest:** None declared.