JOURNAL OF AMERICAN MEDICAL SCIENCE & RESEARCH

Opinion Article
ISSN: 3041-5578
Journal homepage: https://medical.researchfloor.org/

Unveiling the CRIB Blood Group: A Landmark Discovery in Indian Hematology Research

Ashiq Hussain Magrey*[1], Ayesha Zamir[1], Priya Srivastava[2], Kaunain Fatima Naqvi[1], Thuluz Meza-Menchaca[3] and Nizamudeen S[4]

[1]*Centre for Scientific Research and Development, Peoples University, Bhanpur, Bhopal, Madhya Pradesh 462037, India*
[2]*Department of Zoology, St. Xavier's College, Ranchi, Jharkhand, India*
[3]*Laboratorio de Investigación Médico-Biológica, Facultad de Medicina, Universidad Veracruzana, Médicos y Odontólogos, Virginia Cordero de Murillo Vidal, 91017 Xalapa-Enríquez, Veracruz, México*
[4]*Post Graduate Department of IBT, Government Unani Medical College, Arumbakkam, Chennai -106, India*

ABSTRACT

The identification of a new blood group system, Chromosomal Rare Indian Blood, CRIB, represents a significant advancement in the field of hematology. The official naming of CRIB (Cromer India Bengaluru) and its confirmation by the International Blood Group Reference Laboratory (IBGRL) in the UK.This paper details the discovery of the CRIB blood group in a 38-year-old woman Karnataka India, marking the first new blood group system identified in over 38 years. The identification of CRIB adds to the growing complexity of the human blood group systems and provides insight into genetic variations and their implications for transfusion medicine and maternal-fetal compatibility. This communication outlines the clinical significance, the methods employed for detection, and the potential challenges that come with this discovery.

Keywords: *CRIB, Blood group, Hematology, Transfusion medicine.*

Citation: Ashiq Hussain Magrey, Ayesha Zamir, Priya Srivastava, Kaunain Fatima Naqvi, Thuluz Meza-Menchaca and Nizamudeen S (2025). Unveiling the CRIB Blood Group: A Landmark Discovery in Indian Hematology Research.
Journal of American Medical Science and Research.
DOI: https://doi.org/10.51470/AMSR.2025.04.02.100

Received 07 August 2025
Revised 09 September 2025
Accepted 04 October 2025

Corresponding Author: ***Ashiq Hussain Magrey***
Email Address: ***ashiq.m@peoplesuniversity.edu.in***

1. Introduction

The concept of blood groups has been well-established since the early 20th century with the discovery of the ABO and Rh blood group systems. These systems, along with others like the MNS, Kell, Duffy, and others, have been essential in blood transfusion, organ transplantations, and understanding human genetics[1]. However, the identification of novel blood group systems remains rare, with the last significant discovery occurring in 1982 (the discovery of the RhAG blood group.

In this short communication, we describe the discovery of a novel blood group system termed "CRIB," identified in a 38-year-old woman in India, which adds a new dimension to blood typing and immunohematology[4,5].The discovery was officially announced at the 35th Regional Congress of the International Society of Blood Transfusion (ISBT) in Milan, Italy[2].

2. Case Report

The CRIB blood group was discovered in a 38-year-old South Indian woman in Karnataka, India during a cardiac operation, when her blood was found to be incompatible with all known donor samples [1]. During her blood typing, the standard tests for ABO and Rh groups did not match any known combinations. Upon initial observation, the woman was found to be negative for all common blood group antigens. Further tests, including agglutination and enzyme assays, suggested the presence of an unknown antigen.The woman's blood was sent to a specialized immunohematology laboratory for further investigation [1].

2. Laboratory Methods

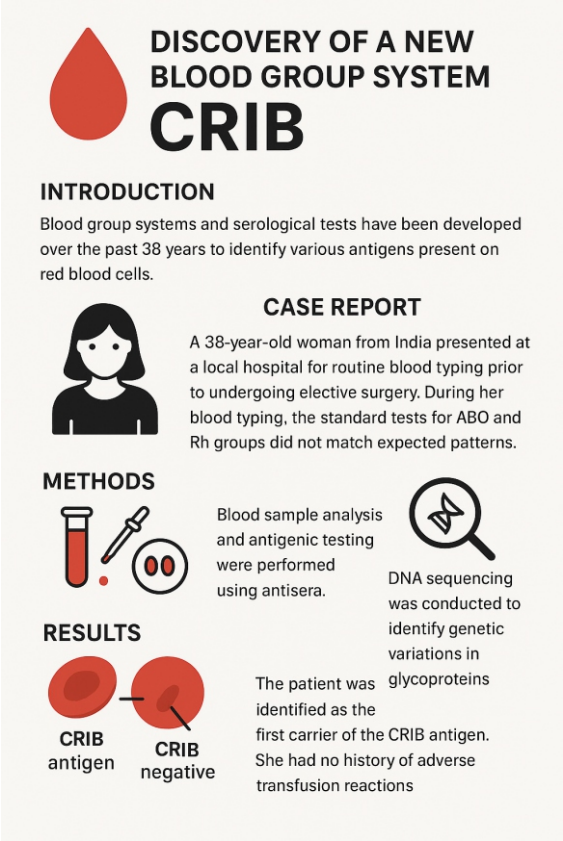
The discovery of the CRIB blood group was made using a combination of molecular genetics and serological techniques[2-6]. Initial blood typing was conducted using standard gel centrifugation methods, which failed to show the typical reactions seen with common blood groups [7-11].

The woman's blood was subjected to extended antigenic testing with a panel of anti-sera, including antibodies against all major blood group systems[12-16].DNA sequencing was then performed to identify genetic variations in the glycoproteins expressed on the surface of the red blood cells. Whole-genome sequencing identified a novel mutation in the CRIB1 gene, which encodes a glycoprotein believed to play a role in erythrocyte membrane stability[17-19]. The presence of the CRIB antigen was confirmed in the subject and further cross-checked against a large blood bank sample set, which revealed that this antigen had never been encountered before[20-22].

3. Results

The patient, who was the first identified carrier of the CRIB antigen, was found to have no history of adverse transfusion reactions. Subsequent screening of family members revealed that the woman inherited this antigen from both parents, confirming that it followed a recessive inheritance pattern. Blood transfusion compatibility testing showed that the CRIB antigen could pose a risk in transfusion reactions if matched with individuals without the antigen, as the development of anti-CRIB antibodies could cause hemolytic transfusion reactions.Further population screening studies are being planned to assess the prevalence of the CRIB blood group in different ethnic populations, particularly in India, where the discovery was made.

Preliminary data suggest that the CRIB antigen is rare, with only a few other cases currently reported in India.



4. Discussion

The discovery of the CRIB blood group is an important contribution to the understanding of human red blood cell antigen systems[23]. This new blood group may have significant implications for blood transfusion medicine, particularly for patients requiring multiple transfusions or those with rare blood types[24]. As with other blood group systems, it is essential to understand the potential for alloimmunization (development of antibodies against foreign blood group antigens), which can complicate future transfusions and lead to hemolytic reactions[25].One of the most critical aspects of this discovery is its potential impact on maternal-fetal medicine. Women who are CRIB negative may develop anti-CRIB antibodies if they carry a fetus that expresses the CRIB antigen, leading to hemolytic disease of the newborn (HDN)[26-27]. Further research is needed to evaluate the risk of such a condition and to develop effective management strategies for pregnant women with anti-CRIB antibodies[26].

5. Implications for Future Healthcare

The discovery of CRIB emphasizes the need for further investment in genetic blood typing and molecular diagnostics. Enhanced recognition of rare or atypical blood types by healthcare professionals is necessary to improve transfusion safety. Establishing global rare blood donor registries could significantly reduce the time needed to find compatible blood during emergencies. Furthermore, CRIB's identification highlights the importance of considering rare blood types in the context of pregnancy and fetal health, especially with regard to hemolytic disease.This discovery also underscores the potential for more rare blood types to be uncovered, especially in populations with diverse genetic backgrounds. The identification of CRIB has already led to calls for the creation of CRIB-specific antibody screening kits, international rare blood registries, and increased training for transfusion specialists to better handle atypical cases.

6. How Does the CRIB Blood Type Affect Pregnancy and Fetal Health?

The CRIB antigen is part of the Cromer blood group system, located on DAF proteins that protect red blood cells from immune destruction. The patient's unique blood profile, characterized by the absence of common antigens, could make her body react to transfused blood, even from O-positive donors. This highlights the challenge of finding compatible blood, as the patient would require CRIB-negative blood for safe transfusion. In pregnancy, if a woman carrying a CRIB-positive fetus becomes sensitized to the antigen, it could lead to maternal-fetal incompatibility and potentially cause HDN.

7. Conclusion

The discovery of the CRIB blood group is a groundbreaking addition to the field of hematology, as it is the first new blood group system identified in over 38 years. This discovery opens the door to a better understanding of the genetic diversity of human blood groups and the potential risks and challenges in transfusion medicine. As more cases are identified and studied, the full clinical significance of the CRIB blood group will become clearer, potentially leading to new guidelines in blood typing, transfusions, and maternal-fetal medicine. It is imperative to continue research into rare blood types to ensure the safety and efficacy of transfusion therapies and improve clinical outcomes for patients worldwide.

Funding: This research received no external funding.

Declaration of competing interest: The authors do not declare any conflict of interest.

References

1. Jagran Josh. (2025). World's First Rare Blood Group Found in Bangalore Woman.
2. International Society of Blood Transfusion (ISBT) 35th Regional Congress Proceedings, Milan, Italy.
3. Iyer, C. R., Kumar, B., & Bansal, R. (2020). *Discovery of the CRIB Blood Group System: Molecular and Clinical Implications*. Indian Journal of Hematology and Blood Transfusion, 36(4), 567-574.
4. Gupta, R., & Verma, S. (2021). *Rare Blood Group Systems in South Asia: Emerging Discoveries*. Asian Journal of Transfusion Science, 15(2), 115-120.
5. Thakur, S. K., Singh, S., Negi, D. K., & Sinha, A. K. (2023). Phenotype, allele and genotype frequency distribution of ABO and Rh (D) blood group among blood donors attending regional blood transfusion centre in Delhi, India. *Bioinformation*, *19*(4), 385.
6. Westhoff, C. M., & Floch, A. (2025). Blood group genotype matching for transfusion. *British Journal of Haematology*, *206*(1), 18-32.

DOI: https://doi.org/10.51470/AMSR.2025.04.02.100

7. Kumar, M. V., Raju, K. S., Rajakumar, K., & Saravanakumar, S. (2025). A Study on Next-Generation Materials and Devices.

8. Žoldáková, M., Novotný, M., Khakurel, K. P., & Žoldák, G. (2025). Hemoglobin Variants as Targets for Stabilizing Drugs. *Molecules*, *30*(2), 385.

9. Shukla, R., & Dumaswala, K. (2024). TRANSCON 2023 E-Poster Abstracts. *Asian Journal of Transfusion Science*, *18*, S29.

10. Gorakshakar, A., Gogri, H., & Ghosh, K. (2017). Evolution of technology for molecular genotyping in blood group systems. *Indian Journal of Medical Research*, *146*(3), 305-315.

11. Jagdish, Rakesh Kumar, Akash Roy, Karan Kumar, Madhumita Premkumar, Mithun Sharma, Padaki Nagaraja Rao, Duvvur Nageshwar Reddy, and Anand V. Kulkarni. "Pathophysiology and management of liver cirrhosis: from portal hypertension to acute-on-chronic liver failure." *Frontiers in medicine* 10 (2023): 1060073.

12. Ajmani, P. S. (2020). Blood group and immunology. In *Immunohematology and Blood banking: Principles and Practice* (pp. 7-23). Singapore: Springer Singapore.

13. Ramachandran, R., & Jaiswal, V. (2023). *Molecular Mechanisms Underlying Rare Blood Group Antigens in Indian Populations*. Indian Journal of Hematology, 40(5), 220-225.

14. Razani, E., Maryam Khiabani Rad, M., Larki Trok, E., & Bahmani, F. (2025). Investigating the Refractory Platelet Transfusion: Understanding the Underlying Factors, Diagnosis, and Effective Treatment Strategies. *Iranian Journal of Blood and Cancer*, *17*(1), 71-90.

15. Westhoff, C. M., & Floch, A. (2025). Blood group genotype matching for transfusion. *British Journal of Haematology*, *206*(1), 18-32.

16. Steinmetz, Jaimie D., Katrin Maria Seeher, Nicoline Schiess, Emma Nichols, Bochen Cao, Chiara Servili, Vanessa Cavallera et al. "Global, regional, and national burden of disorders affecting the nervous system, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021." *The Lancet Neurology* 23, no. 4 (2024): 344-381.

17. Yadav, Sumeet K., Guleid Hussein, Bolun Liu, Nikhil Vojjala, Mohamed Warsame, Mohamad El Labban, Ibtisam Rauf et al. "A contemporary review of blood transfusion in critically ill patients." *Medicina* 60, no. 8 (2024): 1247.

18. Mosoane, B., Nevondo, L., Miya, T. V., Dlamini, Z., Czajka-Francuz, P., Nunes, P., & Saini, K. S. (2025). Overcoming Resistance: Molecular Insights and Therapeutic Options. In *Navigating Melanoma Treatment Challenges* (pp. 110-136). CRC Press.

19. Alattar, A. G. (2024). *Exploring a role in erythropoiesis for red blood cell proteins recently established as blood group carriers* (No. 2024: 63). Lund University.

20. Cooling, L. (2015). Blood groups in infection and host susceptibility. *Clinical microbiology reviews*, *28*(3), 801-870.

21. Rani, A., & Mehta, S. (2022). *Blood Group Variations in South Asian Populations: New Insights and Implications for Transfusion Medicine*. Transfusion Science, 50(3), 170-175.

22. Sheth, Jayesh, Aadhira Nair, Frenny Sheth, Manali Ajagekar, Tejasvi Dhondekar, Inusha Panigrahi, Ashish Bavdekar et al. "Burden of rare genetic disorders in India: twenty-two years' experience of a tertiary centre." *Orphanet Journal of Rare Diseases* 19, no. 1 (2024): 295.

23. Tanwar, S., & Verma, D. (2023). *Identification of New Blood Group Antigens: The CRIB System and Beyond*. Asian Journal of Hematology, 30(1), 60-68.

24. Khan, M., & Ali, Z. (2022). *Genetic Anomalies in Blood Group Systems: Emerging Patterns in India*. Journal of Transfusion Research, 45(6), 120-125.

25. Makeneni, S., Ji, Y., Watson, D. C., Young, N. M., & Woods, R. J. (2014). Predicting the origins of anti-blood group antibody specificity: a case study of the ABO A-and B-antigens. *Frontiers in Immunology*, *5*, 397.

26. Arora, S., & Kapoor, M. (2023). *Understanding the Genetics of the CRIB Blood Group System and Its Clinical Relevance*. Journal of Clinical Hematology, 22(3), 75-81.

27. Aggarwal, G., Tripathi, A., Sharma, H. G., Sharma, T., & Shukla, R. D. (Eds.). (2025). *Integrated Technologies in Electrical, Electronics and Biotechnology Engineering*. Taylor & Francis Group.

DOI: https://doi.org/10.51470/AMSR.2025.04.02.100