Title: Blood Banks in India: A Retrospective Cross-sectional Analysis of Blood Volumes, Safety, and Regulation

Authors: Gaurav M Urs[1] Yash Kamath[1,2] Padmavathy Krishna Kumar[1,3] Siddhesh Zadey[1,4,5]

Affiliations:
1 Association for Socially Applicable Research (ASAR), Pune, Maharashtra, India
2 Seth GS Medical College and KEM Hospital, Mumbai, Maharashtra, India
3 Adichunchanagiri Institute of Medical Sciences, B G Nagara, Karnataka, India
4 Department of Surgery, Duke University School of Medicine, Durham North Carolina USA
5 D.Y. Patil Medical College, Hospital, and Research Centre, Pune, Maharashtra, India

Background: The Lancet Commission on Global Surgery (LCoGS) and subsequent research has highlighted a number of gaps in blood banking and its impact on surgical care in several low- and middle-income countries, including India. A comprehensive assessment investigating the themes mentioned in LCoGS remains scant. We created a framework with multiple composite indices to score and rank Indian districts by their blood bank performance.

Methods: For this retrospective cross-sectional analysis, data was extracted from the National Blood Transfusion Council for the most recent year: 2016. Twenty-four variables were obtained for 616 districts across 35 states and union territories. Our framework, based on LCoGS, considered five themes for synthesising composite indices: accreditation (no. of variables = 2), ownership (3), infrastructure (5), blood handling safety (5), and blood volume (9). Mazziotta Pareto Index (MPI) method was used to construct the indices. Five thematic and one overall indices were calculated for each district. These values were scaled to range from 0 to 100 using min-max scaling. Lower values reflected poor performance. Districts were then ranked using these MPI values for thematic and overall indices.

Results: For 616 districts, median [interquartile range] index values were 7.16 [3.64, 10.64] for accreditation, 4.69 [1.36, 20.49] for infrastructure, 4.17 [2.17, 8.56] for ownership, 7.39 [3.22, 12.26] for safety, 36.21 [29.85, 44.31] for volume and 32.45 [27.31, 40.63] for overall indices. Mumbai (Maharashtra) ranked first for accreditation, Tawang (Arunachal Pradesh) for safety, Bangalore (Karnataka) for ownership and infrastructure, and Kolkata (West Bengal) for volume and overall index. At the last were Manipur's Bishnupur, Tamenglong, Ukhru districts and Meghalaya's East-Jaintia-Hills, North-Garo-Hills, South-Garo-Hills, South-West-Khasi-Hills for accreditation, infrastructure, and ownership, Ramanagara in Karnataka for volume, and Mahasamund in Chhattisgarh for overall index. For safety, 61 districts scored 0, sharing the last rank.

Conclusion: We provide an easy way to calculate and interpret the framework of indices that corresponds to the LCoGS targets. This framework can be used for monitoring and evaluating facilities and can support local blood-banking policies and strategies unique to each district.

Blood Banks in India: A Retrospective Cross-sectional Analysis of Blood Volumes, Safety, and Regulation

Gaurav M Urs[1], Yash Kamath[1,2], Padmavathy Krishna Kumar[1,3] , Siddhesh Zadey[1,4,5]

1 Association for Socially Applicable Research (ASAR), Pune, Maharashtra, India, 2 Seth GS Medical College and KEM Hospital, Mumbai, Maharashtra, India, 3 Adichunchanagiri Institute of Medical Sciences, B G Nagara, Karnataka, India, 4 Department of Surgery, Duke University School of Medicine, Durham North Carolina USA, 5 D.Y. Patil Medical College, Hospital, and Research

Background

The Lancet Commission on Global Surgery (LCoGS) and subsequent research has highlighted a number of gaps in blood banking and its impact on surgical care in several low- and middle-income countries, including India.

A comprehensive assessment investigating the themes mentioned in LCoGS remains scant.

We created a framework with multiple composite indices to score and rank Indian districts by their blood bank performance.

Methods

**Study Design:** Retrospective cross-sectional analysis

Data Sources: National Blood Transfusion Council (2016), National AIDS Control Organization (NACO)

Data analysis: Twenty-four variables were obtained for 616 districts across 35 states and union territories.

- Our framework, based on LCoGS, considered five themes for synthesising composite indices: accreditation, ownership, infrastructure, blood handling safety, and blood volume.
- Mazziotta Pareto Index (MPI) method was used to construct five thematic and one overall indices for each district.
- These values were scaled to range from 0 to 100 using min-max scaling. Lower values reflected poor performance.
- Districts were then ranked using these MPI values for thematic and overall indices.

Results

Theme	Description
Volume	Collection of blood, donation type, and separation of components component separation
Safety	Screening for transfusion infections and quality assurance
Ownership	Ownership status and their location
Infrastructure	Equipment used at blood banks for collection, testing, storage, and transit.
Accreditation	NACO standardization of the banks.
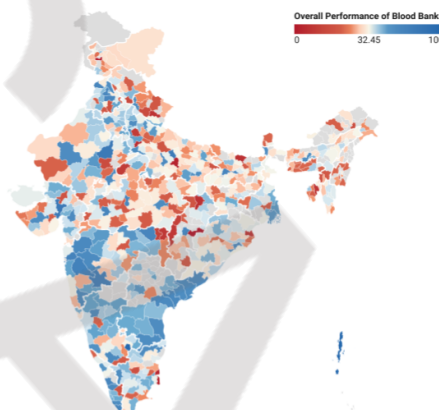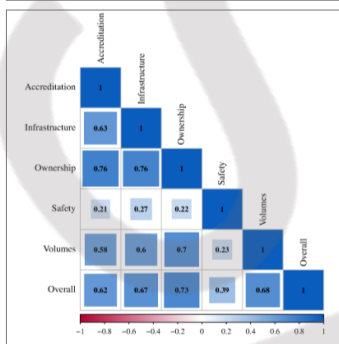
Index	Median [Interquartile Range]
Accreditation	7.16 [3.64, 10.64]
Infrastructure	4.69 [1.36, 20.49]
Safety	7.39 [3.22, 12.26]
Ownership	4.17 [2.17, 8.56]
Volume	36.21 [29.85, 44.31]
Overall	32.45 [27.31, 40.63]

Conclusions

We provide an easy way to calculate and interpret the framework of indices that corresponds to the LCoGS targets. This framework can be used for monitoring and evaluating facilities and can support local blood-banking policies and strategies unique to each district.

Acknowledgments