Blood Banking in India: Ten Years Later
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Objectives

- Describe the Indian Immunohematology Initiative.
- Explain the transition in pretransfusion testing practice in India over the last 10 years.
- Discuss the successes and challenges of implementing a program.
Indian blood bankers soaking up U.S. know-how

Dr. Prithvi, who observed his Bücher-Anniversary trip to India, where he has seen several blood banks, said that Indian blood banks are in the process of developing immunohematology. He noted that Indian blood banks are particularly interested in blood group antibody testing, which is a key component of blood centers. The typical person testing for blood group antibodies in India is an ABI and experience in the donor and recipient, which is a common practice. Labs for crossmatch, crossmatch, and sample testing are essential. He also noted that Indian blood banks, unlike their counterparts, do not use automated systems for blood group antibody testing. Instead, they rely on manual methods. Dr. Prithvi emphasized the importance of crossmatch in Indian blood banks and the need for more training and education in this area. He noted that Indian blood banks are interested in learning more about the latest techniques and technologies that are available in the United States. He also highlighted the importance of networking and collaboration between Indian and U.S. blood banks to share knowledge and best practices.
Indian Immunohematology Initiative

• The goal of III is to improve the safety of blood transfusion in India by promoting implementation of up-to-date immunohematologic testing methods.

Indian Immunohematology Initiative

• Conduct hands-on ("wet") workshops
• Provide and support immunohematology instruction at the annual ISBTI meeting
• Perform consultations and support for implementation of improved testing at Indian blood centers and hospitals
• Host Indian immunohematologists for technical training in members' laboratories
## India - Demographics

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2016</th>
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<tbody>
<tr>
<td>Population, est.</td>
<td>1,111,713,910</td>
<td>1,326,801,576</td>
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<tr>
<td>Birth Rate/1,000</td>
<td>22</td>
<td>20</td>
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<tr>
<td>Infant Mortality</td>
<td>54.6</td>
<td>41.8</td>
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<tr>
<td>Rate/1,000</td>
<td></td>
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<tr>
<td>Life Expectancy</td>
<td>64.7</td>
<td>68</td>
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</table>

[http://data.worldbank.org/indicator/SP.DYN.LE00.IN](http://data.worldbank.org/indicator/SP.DYN.LE00.IN)
Countries Ranked by Population: 2016

1  China  1,373,541,000  
2  India  1,326,801,000  
3  United States  323,996,000  
4  Indonesia  231,820,243  
5  Brazil  205,824,000

Data updated 08-24-2016
Source: U.S. Census Bureau, International Data Base

Human Development Index (HDI)
- Life Expectancy Index
- Life expectancy at birth (in years)
- Education Index (EI)
- Mean years of schooling (in years)
- Expected years of schooling (in years)
- Income Index
- Per capita income
Developing Countries Blood Usage

- In low-HDI countries, up to 65% of blood transfusions are given to children under 5 years of age
- Childbirth
  - Globally ½ million women die from hemorrhage in childbirth
- Trauma

http://www.nationsonline.org/oneworld/human_development.htm

2001/2002 Data – Total WB Donations 81 million

Blood Supply Worldwide - 2016

July 2016 Data – Total WB Donations 112.5 million
Indian Blood Banks

• 2006 – 1,850 blood banks
  • 52% of donors are volunteer

• 2016 – 2,760 blood banks!

Indian Blood Donors

• 2006
  • “Professional Blood Sellers”
    • Pose as replacement donors
    • Majority of public sector and physicians “buy” blood
  • Easier to “hire” a professional blood seller
  • ~50% volunteer

• 2016
  • ~30-100% volunteer (~65%)
Accreditation

• The National Accreditation Board for Hospitals and Healthcare Providers (NABH), an arm of Quality Council of India (QCI), launched its accreditation standard programme for blood banks and transfusion services on January 25, 2008.

Standards & Accreditation

• Standards for Blood Banks and Transfusion Services – 1st ed. 2008
• National AIDS Control Organization (NACO), Ministry of Health and Family Welfare, Government of India
• U.S Centers for Disease Control and Prevention (HHS/CDC) Division of Global HIV and TB (DGHT), India grant
• Christian Medical College, Vellore & Christian Medical Association of India (CMAI), New Delhi
Assessment of NACO Supported Blood Banks 2016

• 1,126 NACO, Ministry of Health and Family Welfare (MoHFW) supported blood (~39.8% of total blood banks)
  • 79% (867) owned by public sector
  • 21% (234) owned by non-profit sector such as non-governmental/non profit, charitable trusts, societies, foundations

Assessment of NACO Supported Blood Banks 2016

• Component Separation
  • 39% (427) had components lab (most non-government)
  • 70% of blood collected from blood banks have component lab (427)
  • Annual collection was 6,828,055 units ~ 60% of blood requirement based on WHO requirements (1% of population)
Crossmatch Laboratory - 2006

- Samples to BC from the area
- Pretransfusion Testing
  - ABO, Rh Forward type on slide
    - A, B, A,B, D
  - One tech performs and a second interprets
- Reverse Type in tubes
- Gel Crossmatch on IgG card

No routine Antibody Detection Test (Screen)!

Positive Crossmatch 2006

- Repeat crossmatch in saline IAT & albumin 37C and IAT test tube
  - 1 minute centrifugation at 1,000 rpm
  - Very few small, benchtop centrifuges available
- No antibody detection test (screen)
Positive Crossmatch 2006

• Switch to O Rh Negative blood and crossmatch with all 3 methods
  • Gel
  • Saline IAT
  • Albumin IAT

Getting Ready to Leave

• Procure workshop samples
  • Known antibody positive donors
• Identify donors with antibodies that could be used for typing
• Label and aliquot tubes
• Pack cooler/suitcase
Curriculum

• Reading agglutination reactions: anti-A titration
• Method comparison; positive antibody screen due to anti-E
  • 2 drops/AHG, 4 drops/AHG, LISS /AHG, Gel
• Antibody I.D. panel & RBC selected cells; anti-E
• Reagent QC

Curriculum, cont’d

• Type & screen x2 & ISXM; 1 xm pos mislabeled unit
• Type & screen/ABO discrepancy due to anti-M
• Antibody Identification - anti-c
• Antibody Identification - anti-K + anti-Fya
• Warm autoantibody; panel, DAT, eluate
ABO, Rh TYPE
FREQUENCY IN GUJARAT

B Pos 26%
O Pos 25%
A Pos 20%

O Neg 2-4%*

* We’ll call you when we need you!

AABB AATM Meeting - Bangalore 2016
27 Respondents

- Blood Center: 9%
- Government Hospital: 57%
- Private Hospital: 30%
- Industry: 4%
- Other:
AABB AATM Meeting – Bangalore 2016
How often do you perform antibody detection/screen?

Number of Responses

- Testing not available
- Only when ordered by patient's physician
- When an Incompatible Crossmatch is Found
- With Every Crossmatch Order

AABB AATM Meeting – Bangalore 2016
What is the routine technique used for antibody detection/screen?

Number of Responses

- Testing Not Available
- Solid Phase
- Tubes
- Column Agglutination Technology
Alloimmunization Rates in Thalassemics of Indian Origin


- 3.79% reported
- Rh and K antibodies account for >90% of antibodies
- Anti-c, Anti-E and Anti-K account for 60%

Lions Blood Bank - Delhi 2011 – 2014 Results

Unpublished Data courtesy of P. Shrivastava

- 61,994 patients
- 723 (1.16%) Positive Antibody Screen
  - 131 (0.21%) Autoantibodies
  - 592 (0.95%) Alloantibodies
- Autoantibodies 18.11%
- Alloantibodies 81.88%
### Lions Blood Bank

**Alloantibodies by Rh D Type**

Unpublished Data courtesy of P. Shrivastava

![Pie Chart](image)

**Pos** 494 (83%)

**Neg** 98 (17%)

**Total** 592

### Specificities of Alloantibodies

**Lions Blood Bank 2011-2014**

Unpublished Data courtesy of P. Shrivastava

<table>
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<tr>
<th>Specificity</th>
<th>Single Ab N-412</th>
<th>Multiple Abs N-206</th>
<th>Total Ab N-618</th>
<th>% of Total N-618</th>
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<td>-D</td>
<td>149</td>
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<td>-C</td>
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<td>-c</td>
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<tr>
<td>-e</td>
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<td>-K</td>
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<td>8</td>
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<td>0.00 %</td>
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<td>0</td>
<td>0</td>
<td>0.00 %</td>
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<tr>
<td>-H</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00 %</td>
</tr>
<tr>
<td>others</td>
<td>06</td>
<td>0</td>
<td>06</td>
<td>0.96 %</td>
</tr>
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</table>

Unpublished Data courtesy of P. Shrivastava
Points to Ponder

• Indian Studies on alloantibodies few, mainly focused on Thalassemia, multi-transfused or antenatal patients
• This study covers the general patient population of Delhi and alloantibody prevalence is ~ 1%
• Need for improving IH practices

Points to Ponder

Dr. Poonam Shrivastava’s Thoughts

• A Robust Rh D Immunisation Programme is needed

• Clinically significant antibodies identified and the problems of many patients who had been denied transfusion earlier from other facilities, were solved!
Bombay Incidence

- Frequency estimated as 1 in 13,000 in Bombay (Bhatia and Sanghvi 1962)
- In 1974 (Bhatia & Sathe) estimated the incidence to be 1 in 7600 in Bombay.
- A systematic screening of Ratnagiri and Sindhudurg districts of Maharashtra, showed the incidence to be 1 in 4500.
- Incidence is 1 in 2500 among Marathas of Ratnagiri and Raigad districts and Goa.
Dr. Joshi discovered Indian Blood Group! $\text{In}^a \& \text{In}^b$

Challenges Over 10 Years

- Building resources in country
- High speed, bench top centrifuge
  - To teach advanced problem solving you need test tubes!
- Shipping samples
  - Improvement with new challenges
- Slow in moving to routine pretransfusion antibody detection (screen)
Challenges Today

• Too many blood banks
• Resources
  • Expense of reagents
• Physician education
• Laboratory Scientist clinical training
• Politics in business
• Enforcement of standards for sustainable improvement

Opportunities

• Increase in volunteer donations
• CDC grant
• NACO moving toward inspection
• Working with AABB to develop accreditation
• Professional Organizations
• Scientific Journals
  • Asian Journal of Transfusion Science
• Education
• Collaboration
First Class in 2006