A Report on the
"Assessment of Blood Banks in Odisha, India"

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Abbreviations

BB	- Blood Bank
BCSU	- Blood Component Separation Units
BTS	- Blood Transfusion Service
CDSCO	- Central Drug Standard Control Organisation
CHEMI	- Chemiluminescence
DAT	- Direct Antiglobulin Test
DCT	- Direct Coombs Test
ELISA	- Enzyme Linked Immuno Sorbent Assay
EQAS	- External Quality Assessment Scheme
FFP	- Fresh Frozen Plasma
HIV	- Human Immunodeficiency Virus
HBV	- Hepatitis B virus
HCV	- Hepatitis C virus
HVPI	- Haemovigilance Program of India
IAT	- Indirect Antiglobulin Test
ICT	- Indirect Coombs Test
IH	- Immunohematology
IQC	- Internal Quality Control
IQR	- Interquartile Range
MoHFW	- Ministry of Health and Family Welfare
NACO	- National AIDS Control Organisation
NAT	- Nucleic Acid Testing
NBTC	- National Blood Transfusion Council
NGO	- Non Governmental Organisation
NHP	- National Health Portal
PSU	- Public Sector Undertaking
QC	- Quality Control
QM	- Quality Manager
QMS	- Quality Management Systems
RPR	- Rapid Plasma Reagin
SACS	- State AIDS Control Societies
SBTC	- State Blood Transfusion Council
SD	- Standard Deviation
SIMS	- Strategic Information Management System
SOPs	- Standard Operating Procedures
TTI	- Transfusion Transmitted Infection
TM	- Technical Manager
TPHA	- Treponema Pallidum Hemagglutination Assay
VNRBD	- Voluntary, Non-Remunerated Blood Donation
VBD	- Voluntary Blood Donor/Donation
WHO	- World Health Organization

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Executive Summary

Blood Banks in Odisha

According to CDSCO, there were 91 blood banks in the state of Odisha in 2015 (CDSCO, 2015). However, the assessment exercise identified 79 functional blood banks. Of the total functional blood banks, 79 blood banks (58 NACO supported – 73.4% and 21 Non-NACO – 26.6%) which have submitted the assessment forms in complete were included in the analysis.
Khordha (10) had the highest number of blood banks followed by Sundargarh (6), Anugul (5), Koraput (5), Sambalpur (5), Balangir (4), Kendujhar (4), Mayurbhanj (4), Baleshwar (3), Bargarh (3) and Rayagada (3)

Around 66% of all the blood banks (52) in the Odisha (n=79) were in 11 districts that are, Khordha (12.7%), Sundargarh(7.6%), Anugul (6.3%), Koraput (6.3%), Sambalpur (6.3%), Balangir (5.1%), Kendujhar (5.1%), Mayurbhanj (5.1%), Baleshwar (3.8%), Bargarh (3.8%) and Rayagada (3.8%).

Considering the number of blood banks per one million population, Sambalpur district (4.8) scored highest whereas Districts such as Nayagarh (1.0), Jagatsinghapur (0.9), Dhenkanal (0.8), Cuttack (0.8), Kendrapara (0.7), Bhadrak (0.7), Puri (0.6), Ganjam (0.6)
recorded less than the State average of 1.9 blood banks per 1,000, 000 (one million) population.

In the assessment 79 blood banks (58 NACO supported and 21 Non-NACO) that submitted the assessment forms were included in the analysis.

Description of blood banks

- Around 17% of blood bank in the state had component separation facility
- Majority of Blood bank (45, 64.3%) are owned by Public sector followed by NGO/Trust/Charitable (20, 28.65%) and private (5, 7.1%).
- Majority of NACO supported blood banks were owned by the public sector (41, 75.9%). Public (6) sector has highest number of blood component separation units followed by Private (4) sector.
- The majority of the blood banks (68, 97.1%) were attached to hospitals, (2, 2.9%) were standalone blood banks.
- The majority of the blood banks (37, 52.9%) had a valid and current license, and the remaining (37; 53%) had applied for renewal. Around 56% of NACO supported (30) and (7, 43.8%) of Non-NACO blood banks had a valid and active license.

- The majority of the blood banks (72; 75%) had a valid and current license, and the remaining (24; 25%) had applied for renewal. Around 60% of NACO supported and (46; 86.8%) of Non-NACO blood banks had a valid and active license.

Annual Collection and Voluntary Blood Donation

- During January 2015 to December 2015, the annual blood collection from all the blood banks that reported was 385,568 of which 72.1% (27,793) units were through voluntary blood donations and the remaining were from replacement donations.
- The average annual collection of blood units of all the blood banks in the state was 5,587 units. The average annual collection of NACO supported blood banks was found to be higher (6,459 units) than the Non-NACO blood banks (2,449 units).
- Blood banks with component separation facility collected (44.5%) of blood units (171,528) and the remaining 55.5% (214,040) were collected by blood banks without the component facility.
- The NACO supported blood banks collected 90.4% (348,827 units) of the total collection, of which 74% (257,991) units were through voluntary blood donation.
- The Non-NACO blood banks collected 9.4 (36,741) units of which 54.3% (19941) units were through voluntary blood donation.

Transfusion Transmitted Infections

- HBV positivity was found to highest with 0.8%. HIV, Syphilis and Malaria has a similar level of positivity of 0.1% followed by HCV with 0.2 % of seroreactivity.

Component Separation

- Around 16% of blood units collected by blood banks with component separation facilities were used for component separation in state.
- The percentage of component separation was higher (41.8%) in Non-NACO blood banks compared to NACO supported blood banks (13.4%).

Quality Management Systems

- The majority of blood banks (92.9%) reported that they adhered to the NBTC guidelines.
- Around 40% of NACO supported blood banks and 50.0% of Non-NACO blood banks reported they had a document control system.
- In terms of Standard Operating Procedures (SOPs) for technical processes, more than 92.9% reported that they had SOPs.
- At the state level, Internal Quality Control (IQC) for Immunohematology was reported by 57.1% of the blood banks and IQC for TTIs was reported by 37.1% of the blood banks.

- Around 74% of the blood banks reported carrying out quality control for kits, reagents and blood bags.
- The percentage of blood banks enrolled in EQAS by recognized providers was found to be only 4.3% for immunohematology and 1.4% for TTIs.
- No Blood bank participated in the assessment were accredited by National Accreditation Board for Hospitals & Healthcare Providers (NABH).
- Designated and trained Quality Managers and Technical managers were available only in 15.7% and 20% of the blood banks respectively.
- More than 68.6% of the blood banks reported that they had a regular equipment maintenance programme and 65.7% reported that they calibrate the equipment as per requirement.

Reporting and Documentation

- Majority of the blood banks (92.9%) reported to be compliant with NBTC guidelines
- Around, 79% of Blood Banks reported that they were recovering processing charges within NBTC/SBTC norms.
- Most of the blood banks (91.4%) reported that they were displaying stock position in their Blood bank Premises.
- 71.4% of the blood banks submitted regular reports to state drug controller, 75.7 % of blood banks regularly reported in national strategic information management systems (SIMS).
- Only 72.9 % regularly reported in E-blood banking either national or state e-blood banking.
- Only 20 % of the Blood banks were members of National Haemovigilance Program.

The current status of blood banks based on the assessment

- The mean assessment score of blood banks in the state was 56.70 (SD: 11.58). The Non NACO blood banks scored slightly higher 58.75 (SD: 10.79) than the Non-NACO blood banks.
- At the state level, the majority of blood banks (60; 86%) scored between 35 to 70, followed by (7; 10%) which scored above 70, and only three blood bank scored less than or equal to 35.
- There are 87 % of Non NACO and 85 NACO supported blood banks scored between 35 and 70. Around, 13 % of Non-NACO blood banks and 9 % of NACO supported blood banks scored more than 70%.
- In terms of score below 35 there were five NACO supported blood bank and two Non-NACO supported blood banks.
- The mean score of blood banks with component facilities (62; SD: 8.93) was found to be higher than the mean score of those without component facilities (55.60; SD: 11.83).

- The mean assessment score of private owned blood banks (65.00; SD: 12.41) was found to be higher than the NGO/Trust/Charitable (56.40; SD: 11.85) and public owned blood banks (55.91; SD: 11.28)
- Irrespective of the NACO support status, 35.7 % (25) blood banks were owned by private sector, of which, 80 % (20) were owned by not-for-profit sector such as, NGO, Trust, and charitable organizations.
- The mean assessment score of blood banks that collected more than 5000 blood units (62.25; SD: 10.73) was found to be higher than those which collected between 3001 to 5000 (57.53; SD: 9.86) and less than 3000 blood units (52.61; SD: 11.69).
- Non-NACO supported blood bank have scored higher than NACO supported blood bank except in category of 50 to 70.
- The mean score was found to be higher among the blood banks that were part of EQAS for immunohematology (66.00; SD: 19.29) as compared to those who were not enrolled (56.28; SD: 11.17).
- There were no blood banks that were accredited by National Accreditation Board of Hospitals and Health care Providers (NABH).

It is evident from the assessment that blood banks that focussed on quality improvement systems performed better than others. Considering the deleterious effect of poor quality practices on patient care, it is imperative that specific programmes and strategies to improve quality systems in blood transfusion services are developed and implemented across the state.

Assessment of Blood Banks in Odisha

1. Background

Blood Transfusion Service (BTS) is an essential part of modern health care system without which medical care is impossible (Pal, Kar, Zaman, & Pal, 2011). Adequate measures to ensure blood safety play a major role in preventing the transmission of HIV, Hepatitis and other bloodborne pathogens in health care settings. The blood and its products must not only be safe but must be clinically effective, and of appropriate and consistent quality (WHO, 2012). Ensuring the safety and availability of blood and blood products is an essential public health responsibility which is primarily the responsibility of the government or the appropriate national health authority of each country (Ramani, Mavalankar, & Govil, 2007). Therefore, it is important to establish a sustainable national blood system that should be supported by a national blood policy, strategic plan, and appropriate legal instruments (WHO, 2011). The Twenty-eighth World Health Assembly resolution number WHA 28.72 of 1975 urged member countries to promote the development of national blood services based on voluntary non-remunerated blood donation (VNRBD); to enact effective legislation governing the operation of blood services and to take other actions necessary to protect and promote the health of blood donors and of recipients of blood and blood products (WHO, 1975).

However, provision of safe and quality blood for a country like India involves a highly complex operation involving various stakeholders, and the magnitude and complexity of issues raise several challenges (GOI, 2003). This requires a holistic and comprehensive approach to planning, designing and operationalizing the BTS. It is important to ensure coordination between blood transfusion services, health services and hospitals, educational institutes, religious, social and industrial organizations, mass media, and other stakeholders including the general public. The system should ensure adequate resources and inputs into the legislative, regulatory, technical, social, and cultural aspects of making this life-saving product accessible and safe.

The need for blood is paramount and universal. However, millions of patients requiring transfusion do not have timely access to safe blood, and there is a major imbalance between developing and industrialized countries in access to safe blood (WHO, 2009). There is a huge inequity in the availability of blood within countries, with the urban areas having more access to the majority of blood available. Even if sufficient blood is available, many are exposed to avoidable, life-threatening risks through the transfusion of unsafe blood. In order to ensure universal access to safe and quality blood, achieve 100% voluntary blood donation and quality-assured testing of donated blood, strengthening the blood transfusion services with evidence-based, innovative and result-oriented strategies are essential. It is also imperative to optimize blood usage, develop quality systems in the transfusion chain, strengthen the workforce, adopt new developments, and build effective partnerships(WHO, 2008).

The National AIDS Control Organization(NACO), under the Ministry of Health and Family Welfare, and the National Blood Transfusion Council (NBTC), which is the apex policy making body, are the prime bodies responsible for the functioning of blood transfusion services and blood safety in India at the national level. At the state level, the respective state AIDS Control societies(SACS) and State Blood Transfusion Councils(SBTCs) are responsible for the smooth functioning of blood transfusion services. As blood and blood products are considered as drugs, the Central Drug Standard Control Organisation(CDSCO) and State Drug Control Organisations play a vital role in key aspects such as, approval of licenses, and enforcement of standard transfusion practices to ensure safe, quality and efficacious blood and blood components in clinical practices.

Several directions, guidelines, and legal measures during the last two decades facilitated the significant improvement of blood transfusion services in the country. The Supreme Court verdict in 1996 directed the government to improve the blood transfusion services that resulted in establishing the National and State Blood Transfusion Councils. The Drugs and Cosmetics Rules, 1945, framed under the Drugs and Cosmetics Act, 1940 were amended in 1993, as a result of which the licensing of blood banks was brought under the dual authority of the state and central government (MoHFW, 2013). The state licensing authority issues the license, while the Drug Controller General (India) is the central license approving authority. In 2002, the WHO Guidelines on the Clinical Use of Blood was adopted by NACO. In the same year, the Government of India framed and adopted the National Blood Policy (NBP) (NACO, 2007a).

In 2007, the National AIDS Control Organization developed standards for blood banks and blood transfusion services. This clearly spelled out the need for mandatory licensing and compliance to all regulatory norms; compliance to policies/ guidelines of NBTC; donor selection/ recruitment/ retention/ counseling based on voluntary non-remunerated regular repeat blood donors; appropriate blood collection procedures; mandatory testing of all donated Blood units for HIV, HBV, HCV, Syphilis and Malaria; transportation of blood and blood components ensuring cold chain maintenance; manpower requirements; maintenance of quality assurance system; regular maintenance and calibration of equipment; biosafety; waste disposal mechanisms; documentation, record keeping and regular reporting under the national programme(NACO, 2007b).

Since the inception of the National AIDS Control programme in 1992, the blood safety programme in India under the National AIDS Control Organization has been making significant strides towards ensuring access to safe, and quality blood and blood products to all those who are in need of a transfusion. The goals and objectives of the programme are to ensure provision of safe and quality blood even to the most remote areas of the country. NACO has been taking continuous steps to strengthen the blood banks across the country by providing equipment, consumables, manpower and capacity building. The efforts to modernizing blood-banks, establishing model blood banks, and setting up blood storage centres in rural areas have improved the quality of blood transfusion services in the country.

The current phase of the NACP IV (2012 -2017) focuses on blood safety that aims to support 1,300 blood banks, and achieve 90,00,000 blood units from NACO supported Blood Banks and 95% Voluntary Blood Donation in 2016-17. The key strategies under NACP IV are strengthening management structures of blood transfusion services, streamlining the coordination and management of blood banks and blood transfusion services, and developing new initiatives such as the establishment of Metro Blood Banks and Plasma Fractionation Centre (NACO, 2014).

Due to the continuous efforts in India, the availability of safe blood increased from 44 lakh units in 2007 to 100 lakh units by 2014-15; during this time HIV seroreactivity also declined from 1.2% to 0.2%, and Voluntary Blood Donation increased substantially (NACO, 2016). NACO has been providing technical and operational support to improve the efficiency and effectiveness of these blood banks, thereby, increasing the availability and accessibility of safe and quality blood and blood products to those who are in need. Though there has been a substantial improvement in BTS in India over a period of time, there are still gaps in ensuring access to quality blood and blood products that needs to be addressed at the district, state and regional levels through an evidence-based approach.

In order to have evidence-based programmes, and policies, accurate and updated information at the district, state and national level is an essential prerequisite. Lack of updated information is one of the key barriers affecting the planning and implementation of blood transfusion services across the country. Though current programmes emphasize Quality Management Systems (QMS) including EQAS and accreditation in blood banks, not much information is available related to this area. In particular, information on the existing practices of blood banks, their potential, and willingness to get involved in the programmes on QMS are critical factors that will facilitate developing appropriate strategies and programmes related to QMS at the National level.

Therefore, facility-wise updated information on structural and programmatic components, the gaps, and challenges are required which will not only facilitate in developing better programmes and policies in BTS, but also serve as a baseline for specific programmes that are being, and will be implemented at the district, state, regional, and national levels. Considering the above factors, a nationwide assessment of all the Blood Banks was conducted.

2. Objectives

The overall purpose of this assessment was to understand the current situation of blood banks, in terms of facilities, services, practices, performance, gaps, and challenges.

The specific objectives were:

- To review the existing situation in blood banks in terms of collection of blood, voluntary blood donation, quality management systems, and other programme areas.
- To categorize and grade the blood banks using a scoring system, for implementation of phased quality improvement systems.
- To provide evidence for the formulation of evidence-based policies and programs for blood transfusion services in India.
- To develop an updated database with basic essential details of blood banks in the country.

3. Methodology

This assessment was a cross-sectional survey that captured the current situation of all the blood banks that are owned by the government, private, non-profit and not-for-profit organizations in the state during the reporting period - January to December 2015. In order to create a comprehensive and accurate list of functional blood banks in the state, data (list of blood banks) from multiple sources were obtained which included NACO, NBTC, CDSCO, state drugs control organizations, SACS, and SBTCs. These were further reviewed for duplication, errors in name and other necessary details, and triangulated to arrive at a comprehensive list of district wise functional blood banks.

Following this, an assessment tool was designed as a web-based survey tool in REDCap Software - Version 6.11.2 which was developed by an informatics core at Vanderbilt University with support from National Center for Research Resources (NCRR) and National Institute of Health (NIH) grants. An exclusive online survey link for each blood bank, generated from REDCap, was sent to all the blood banks. This online link was linked to the email ID of the blood bank and Unique IDs created for each blood bank. Since many blood banks did not have adequate internet facility, a paper format was also developed which was sent to all the blood banks by post with a pre-stamped and self-addressed envelope. The data from the completed paper forms were then entered into REDCap.

Tool: A self-assessment questionnaire that included all the below-mentioned components was developed in consultation with programme officials and experts from the areas of public health, epidemiology, bio-statistics, and transfusion medicine.

The review focused on the following components:

Table 1-Details of technical areas included in the assessment

S No	Component	Description
1	General	Basic details, Ownership, Category, License, etc.
2	Collection and VBD	Annual Collection, VNRBD and donor management
3	Technical – IH, TTIs, components	Methods, Performances
4	Quality Management System	Check for compliance to guidelines and standards
5	HR, Training, and Equipment	Availability and Participation

Data Management and Analysis: The database for this study was developed and maintained by Clinical Data Management Centre (CDMC), Department of Biostatistics, Christian Medical College, and Vellore, India. In-built validation checks were incorporated in the system to confirm that all study related parameters are captured completely and accurately.

Data were analyzed using SPSS Version 21 for Windows. The data were screened for outliers and extreme values using histograms, frequency distribution and Box plots. To summarize the whole data, frequency distributions and bar/pie charts were done for qualitative (categorical) variables such as ownership, type of blood banks etc., and descriptive statistics like mean, standard deviation (SD), median, minimum, and maximum were done for quantitative variables such as annual collection, voluntary blood donation, etc.

Categorisation of blood banks and scoring: In order to study variables that impact quality, the blood banks have been categorized into two groups based on the availability of component separation facility. The first category comprises of blood banks with component separation facility that includes Model Blood Banks and Blood Component Separation Units (BCSU) in NACO supported blood banks. Model blood banks collect more than 10,000 units and BCSUs collect between 5,000 to 10,000 units of blood annually. The second category includes blood banks without component separation facility that covers major blood banks and District Level blood banks (DLBB) in NACO supported blood banks. Major blood banks collect between 3,000 to 5,000 units and district level blood banks collect up to 3,000 units annually.

Each component of the tool was given a weight based on the programmatic and quality priorities. The maximum achievable sum of all weighted scores under each component totaled 100 marks.

Table 2- Scoring details and weight

Details	With Components	Without Components
Licence	3	3
Annual Collection, VBD, Repeat donation and Counselling	11	16
Technical - IH, TTI and Component separation	43	38
Quality Management Systems	35	35
Reporting	8	8
TOTAL	**100**	**100**

The scoring pattern was different based on the category of blood banks that are: 1. Blood banks with component separation facility (n=12) and, 2. Blood banks without component separation facility (n=58). Scores were allocated to each indicator under specific components based on the expected level of performance by these two categories of blood banks.

The blood banks were categorized based on the scores obtained by each blood bank that are, less than and equal to 35 (Red); 36 to 70 (Yellow) and above 70 (Green).

4. Key Findings

According to CDSCO, there were 91 blood banks in the state of Odisha in 2015 (CDSCO, 2015). However, the assessment exercise identified 79 functional blood banks. Of the total functional blood banks, 79 blood banks (58 NACO supported – 73.4% and 21 Non-NACO – 26.6%) which have submitted the assessment forms in complete were included in the analysis.

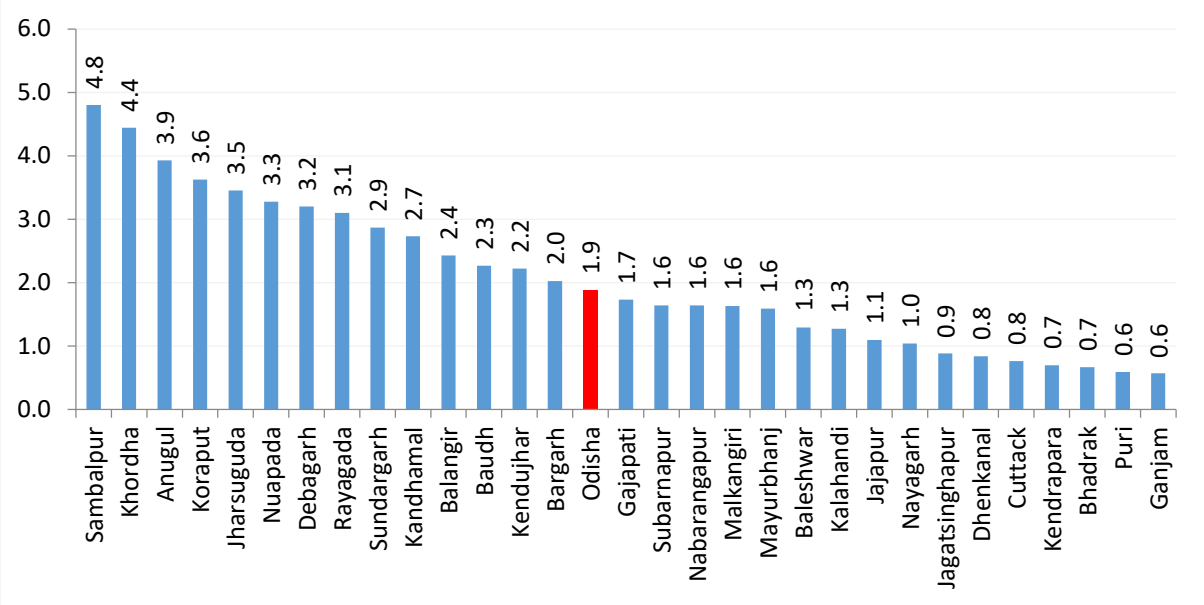
Table 3 State wise description of blood banks

District	NACO supported	Non-NACO	Total
Anugul	3	2	5
Balangir	4	-	4
Baleshwar	2	1	3
Bargarh	2	1	3
Baudh	1	-	1
Bhadrak	1	-	1
Cuttack	2	-	2
Debagarh	1	-	1
Dhenkanal	1	-	1
Gajapati	1	-	1
Ganjam	2	-	2
Jagatsinghapur	1	-	1
Jajapur	2	-	2
Jharsuguda	1	1	2
Kalahandi	2	-	2
Kandhamal	2	-	2
Kendrapara	1	-	1
Kendujhar	4	-	4
Khordha	3	7	10
Koraput	2	3	5
Malkangiri	1	-	1
Mayurbhanj	4	-	4
Nabarangapur	1	1	2
Nayagarh	1	-	1
Nuapada	2	-	2
Puri	1	-	1
Rayagada	2	1	3
Sambalpur	4	1	5
Subarnapur	1	-	1
Sundargarh	3	3	6
Odisha	**58**	**21**	**79**

Table - 3 indicates the district wise details of all the blood banks in the state, including the description of NACO supported and Non-NACO blood banks. Khordha (10) had the highest number of blood banks followed by Sundargarh (6), Anugul (5), Koraput (5) ,Sambalpur (5), Balangir (4), Kendujhar (4), Mayurbhanj (4), Baleshwar (3), Bargarh (3) and Rayagada (3)

Around 66% of all the blood banks (52) in the Odisha (n=79) were in 11 districts that are, Khordha (12.7%), Sundargarh (7.6%), Anugul (6.3%), Koraput (6.3%), Sambalpur (6.3%), Balangir (5.1%), Kendujhar (5.1%), Mayurbhanj (5.1%), Baleshwar (3.8%), Bargarh (3.8%) and Rayagada (3.8%).

Figure 1- Availability of BBs per 1,000,000 (1 million) Population



Considering the number of blood banks per one million population, Sambalpur district (4.8) scored highest whereas Districts such as Nayagarh (1.0), Jagatsinghapur (0.9), Dhenkanal (0.8), Cuttack (0.8), Kendrapara (0.7), Bhadrak (0.7), Puri (0.6), Ganjam (0.6) recorded less than the State average of 1.9 blood banks per 1,000, 000 (one million) population.

4.1 Basic details of blood banks (n=79)

As indicated earlier, 79 blood banks (58 NACO supported and 21 Non-NACO) that submitted the assessment forms were included in the analysis.

4.1.1 Category of Blood Banks: Out of 58 NACO supported blood banks 11.1% (6) of the blood banks had component separation facility. Out of 21 Non-NACO blood banks 37.5% (6) were with component separation facility.

Table 4-Basic details of blood banks

Specifics	Description	NACO Supported	Non-NACO	Total
Type of BB	With components	6(11.1%)	6(37.5%)	12(17.1%)
	Without components	48(88.9%)	10(62.5%)	58(82.9%)
Ownership	NGO/Trust/Charitable	13(24.1%)	7(43.8%)	20(28.65)
	Private	-	5(31.3%)	5(7.1%)
	Public	41(75.9%)	4(25.0%)	45(64.3%)
Licence	Valid	30(55.6%)	7(43.8%)	37(52.9%)
	Under Renewal	24(44.4%)	9(56.3%)	33(47.1%)
Attachment	Attached to Hospital	53(98.1%)	15(93.8%)	68(97.1%)
	Attached to lab	-	-	-
	Stand alone	1(1.9%)	1(6.3%)	2(2.9%)

At the district level, Khurda (6, 66.7%) had the highest percentage of blood component depration units, followed by Cuttack (2, 100%), Angul (1, 33.3%), Ganjam (1, 50%), Sambalpur (1, 20%) and Sundargarh (1, 16.7%). Majority of the districts (76.6%) does not have blood component separation units.

4.1.2 Ownership: As depicted in Table:-4, majority of Blood bank (45, 64.3%) are owned by Public sector followed by NGO/Trust/Charitable (20, 28.65%) and private (5, 7.1%). Majority of NACO supported blood banks were owned by the public sector (41, 75.9%). Public (6) sector has highest number of blood component separation units followed by Private (4) sector.

Majority of not-for-profit blood banks(n=20) were clustered in 18 districts which are Sambalpur and Sundargarh with 11.1% (2) followed by Angul, Bargarh, Boudh, Cuttack, Dhenkanal, Gajapati, Ganjam, Kalahandi, Kandhamal, Khurda, Koraput, Mayurbhanj,

Nabarangpur, Nuapada, Puri and Rayagada with 5.6% (1). Around 69% of all public owned blood banks (n=45) were clustered in 11 districts which are Balangir (4, 8.9%), Khurda (4, 8.9%), Sundargarh (4, 8.9%), Keonjhar (3, 6.7%), Koraput (3, 6.7%), Sambalpur (3, 6.7%), Angul (2, 4.4%), Balasore (2, 4.4%), Jajpur (2, 4.4%), Mayurbhanj (2, 4.4%) and Rayagada (2, 4.4%). (Refer Table - 5)

Table 5 -District wise list of blood banks by Ownership

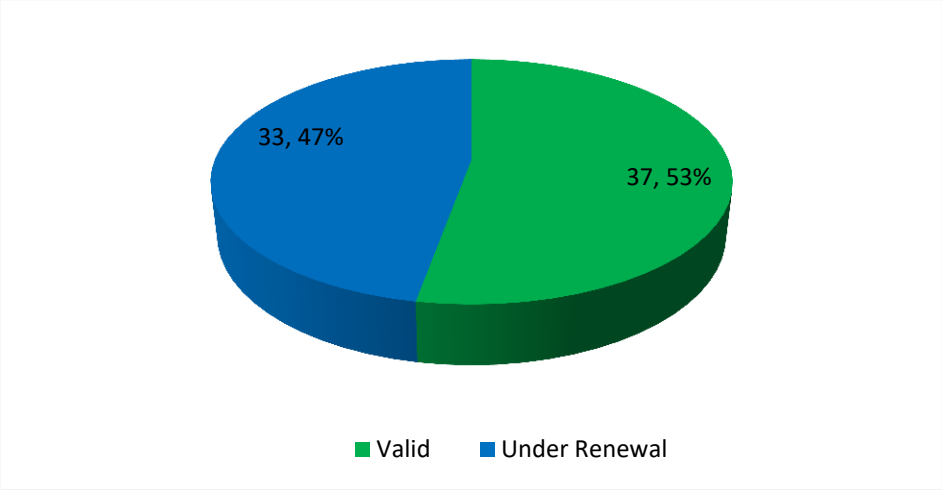
District	Public	%	NGO/Trust /charitable	%	Private	%	Total
Angul	1	33.3	-	-	2	66.7	3
Balangir	-	-	-	-	4	100.0	4
Balasore	-	-	-	-	2	100.0	2
Bargarh	1	50.0	-	-	1	50.0	2
Bhadrak	-	-	-	-	1	100.0	1
Boudh	1	100.0	-	-	-	-	1
Cuttack	1	50.0	-	-	1	50.0	2
Deogarh	-	-	-	-	1	100.0	1
Dhenkanal	1	100.0	-	-	-	-	1
Gajapati	1	100.0	-	-	-	-	1
Ganjam	1	50.0	-	-	1	50.0	2
Jagatsinghpur	-	-	-	-	1	100.0	1
Jajpur	-	-	-	-	2	100.0	2
Jharsuguda	-	-	1	50.0	1	50.0	2
Kalahandi	1	50.0	-	-	1	50.0	2
Kandhamal	1	50.0	-	-	1	50.0	2
Keonjhar	-	-	-	-	3	100.0	3
Khurda	1	11.1	4	44.4	4	44.4	9
Koraput	1	25.0	-	-	3	75.0	4
Malkangiri	-	-	-	-	1	100.0	1
Mayurbhanj	1	33.3	-	-	2	66.7	3
Nabarangpur	1	50.0	-	-	1	50.0	2
Nayagarh	-	-	-	-	1	100.0	1
Nuapada	1	50.0	-	-	1	50.0	2
Puri	1	100.0	-	-	-	-	1
Rayagada	1	33.3	-	-	2	66.7	3
Sambalpur	2	40.0	-	-	3	60.0	5
Subarnapur	-	-	-	-	1	100.0	1
Sundargarh	2	33.3	-	-	4	66.7	6
Odisha	**20**	**28.6**	**5**	**7.14**	**45**	**64.3**	**70**

4.1.3 Organizational Attachment: The majority of the blood banks (68, 97.1%) were attached to hospitals, (2, and 2.9%) were standalone blood banks.

The majority of the NACO supported blood banks (53, 98.1%) were attached to hospitals and only (1, 1.9%) were standalone blood banks. Though (15, 93.8%) of the Non-NACO supported blood banks were attached to hospitals, a significant number (1, 6.3%) of Non-NACO blood banks were standalone. Further analysis indicated that in NACO supported blood banks (41, 100%) of the blood banks are in the public sector, and (12; 92.3%) of the blood banks are in the not-for-profit sector were attached to hospitals.

4.1.4 License details of blood banks: The license status was categorized as "valid" which means that the blood bank has current and active license; and "deemed renewal" which means that the blood bank had applied for renewal which is pending.
The majority of the blood banks (37, 52.9%) had a valid and current license, and the remaining (37; 53%) had applied for renewal. Around 56% of NACO supported (30) and (7, 43.8%) of Non-NACO blood banks had a valid and active license. Similarly, (24, 53.3%) of the public blood banks, (11, 55%) of the not-for-profit blood banks, and (2, 40%) of the public blood banks had a valid and active license.

Figure 2-License Status (n=79)



The majority of those blood banks(23, 69.7%) which have reported as "deemed renewal" had their last inspection by licencing authority during the last one year; (7, 21.2%) had their inspection between the last 1 to 2 years and (3, 9.1%) had their inspection between 2 to 3 years.

4.2 Annual Blood Collection and Voluntary Blood Donation

According to WHO, it is estimated that blood donation by 1% of the population can meet a nation's most basic requirements for blood (WHO, 2016b), which means the state with a population of 41,974,218, currently needs around 419,742 units of blood. As per this criteris, Odisha is producing more than what is required.

4.2.1 Annual Collection of Blood: During January 2015 to December 2015, the annual blood collection from all the blood banks that reported was 385,568 of which 72.1% (27,793) units were through voluntary blood donations and the remaining were from replacement donations.

Figure 3 Annual Collections and Voluntary Donation

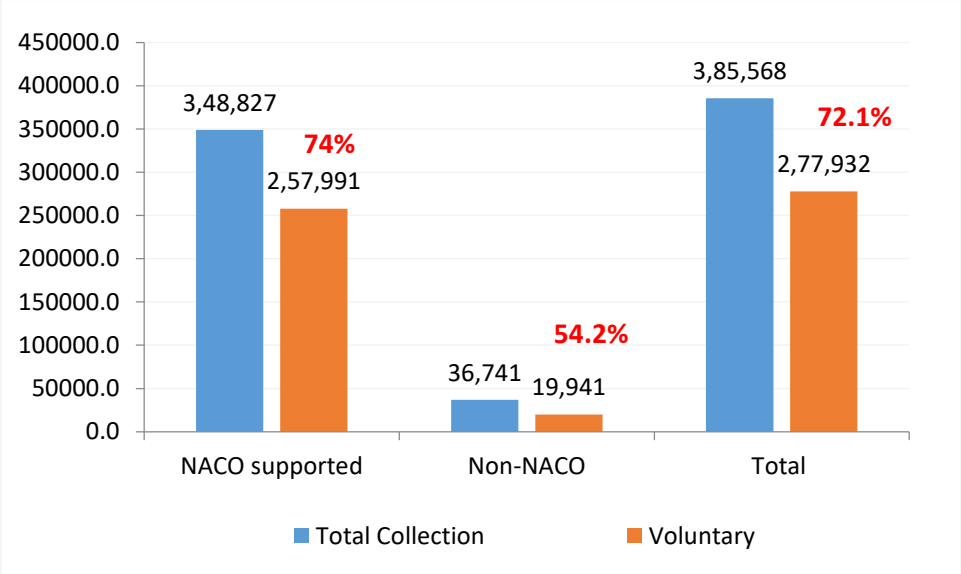
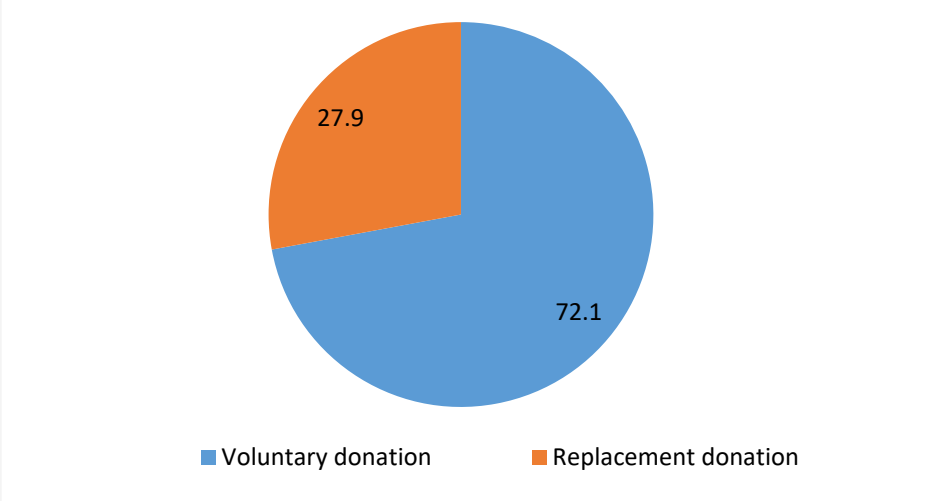


Figure 4 -Type of Blood Donation (Voluntary vs Replacement Donation %)



The average annual collection of blood units of all the blood banks in the state was 5,587 units. The average annual collection of NACO supported blood banks was found to be higher (6,459 units) than the Non-NACO blood banks (2,449 units).

Table 6-Average Annual collection

District	NACO	Non-NACO	All BBs
Angul	5986	354	4109
Balangir	3232	-	3232
Balasore	8240	-	8240
Bargarh	6407	-	6407
Bhadrak	9546	-	9546
Boudh	1623	-	1623
Cuttack	33166	-	33166
Deogarh	2490	-	2490
Dhenkanal	6074	-	6074
Gajapati	2772	-	2772
Ganjam	14984	-	14984
Jagatsinghpur	1885	-	1885
Jajpur	2990	-	2990
Jharsuguda	7551	768	4159
Kalahandi	5544	-	5544
Kandhamal	3433	-	3433
Keonjhar	4161	-	4161
Khurda	10045	4559	6616
Koraput	3649	205	1927
Malkangiri	2849	-	2849
Mayurbhanj	4704	-	4704
Nabarangpur	4330	2508	3419
Nayagarh	5607	-	5607
Nuapada	2521	-	2521
Puri	5261	-	5261
Rayagada	2070	2515	2218
Sambalpur	7031	262	5677
Subarnapur	3663	-	3663
Sundargarh	6468	2376	4422
Odisha	**6459**	**2449**	**5587**

Similarly, the blood banks with component separation units recorded a average higher collection of 14,294 units compared to blood banks without blood component separation units which was 3,755 units. However, the variation in the collection was found to be very high across and within districts.

The NACO supported blood banks collected 90.4% (348,827 units) of the total collection, of which 74% (257,991) units were through voluntary blood donation. The Non-NACO blood banks collected 9.4 (36,741) units of which 54.3% (19,941) units were through voluntary blood donation. Blood banks with component separation facility collected (44.5%) of blood

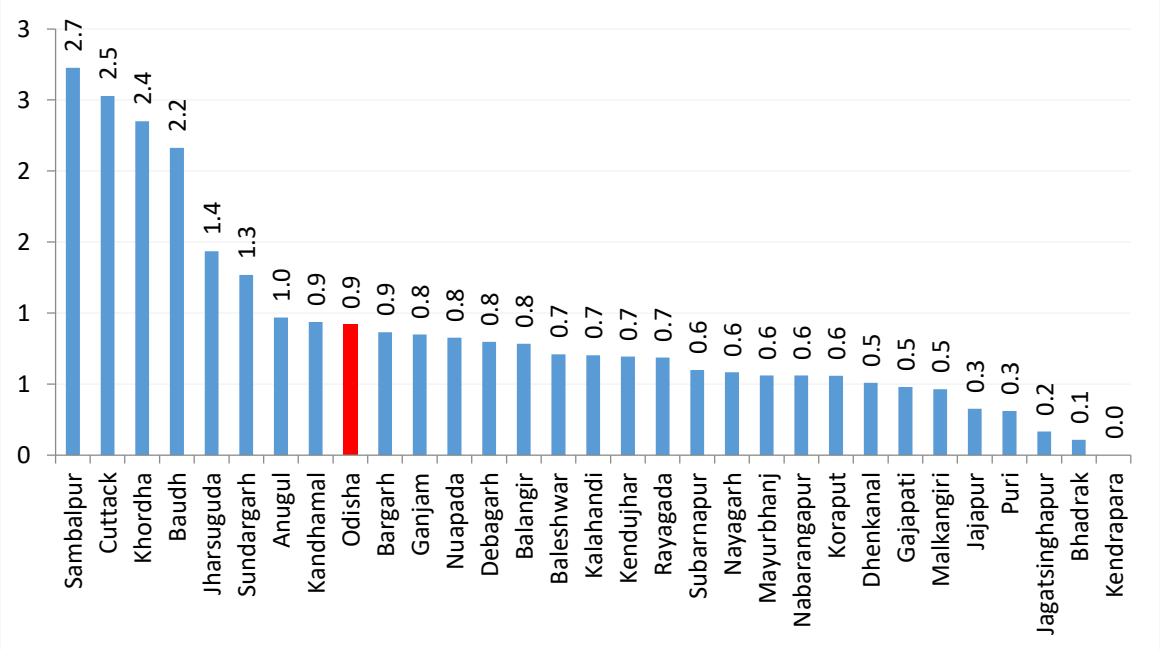
units (171,528) and the remaining 55.5% (214,040) were collected by blood banks without the component facility. Similarly, blood banks owned by public sector collected 67.6% (260,492) of the total collection followed by the not-for-profit sector 27.2% (104,824) and private sector blood banks 5.3% (260,492).

Table-7 indicates the district-wise details of the total annual collection, voluntary and replacement donation in the state of Odisha. Blood banks reported a varying proportion of VNRBD ranging from 43 to 100%.

Table 7-Annual blood collection and percentage of VBD

District	Total Voluntary Donation	Replacement Donation	Annual Collection	VBD %
Angul	10661	1666	12327	86.5
Balangir	8286	4644	12930	64.1
Balasore	15799	681	16480	95.9
Bargarh	9708	3106	12814	75.8
Bhadrak	8948	598	9546	93.7
Boudh	1233	390	1623	76.0
Cuttack	40832	25500	66332	61.6
Deogarh	2337	153	2490	93.9
Dhenkanal	5980	94	6074	98.5
Gajapati	1787	985	2772	64.5
Ganjam	17949	12020	29969	59.9
Jagatsinghpur	1621	264	1885	86.0
Jajpur	5294	687	5981	88.5
Jharsuguda	7239	1080	8319	87.0
Kalahandi	4786	6303	11089	43.2
Kandhamal	5558	1309	6867	80.9
Keonjhar	6577	5908	12485	52.7
Khurda	37800	15130	52930	71.4
Koraput	6488	1221	7709	84.2
Malkangiri	2849	-	2849	100.0
Mayurbhanj	10565	3547	14112	74.9
Nabarangpur	4839	1999	6838	70.8
Nayagarh	4841	766	5607	86.3
Nuapada	2842	2201	5043	56.4
Puri	4943	318	5261	94.0
Rayagada	3297	3358	6655	49.5
Sambalpur	24070	4316	28386	84.8
Subarnapur	3598	65	3663	98.2
Sundargarh	17205	9327	26532	64.8
Odisha	**277932**	**107636**	**385568**	**72.1**

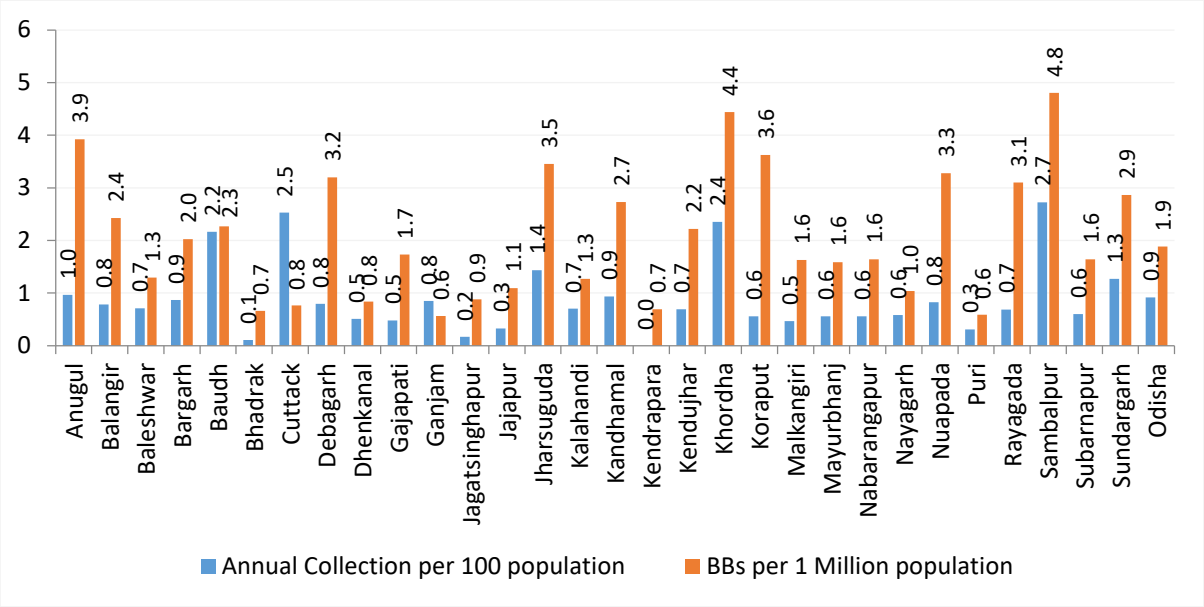
Figure 5-Annual Collection per 100 population- District wise



The annual collection of blood units per 100 individuals was found to be around 1% in the country, which is meeting the WHO suggested requirement that 1% of the population can meet a nation's most basic requirements for blood. However, there is a huge disparity in the collection of blood between districts. Sambalpur collected highest of 2.7 units of blood per 100 population followed by Cuttack (2.5), Khordha (2.4) and Baudh (2.2) whereas Bhadrak (0.1), Jagatsinghapur (0.2), Puri (0.3) and Jajapur (0.3) collected less than the state average. Eight districts in the state recorded an annual collection of more than the state average of 0.9 units per 100 populations. (Refer Fig-5)

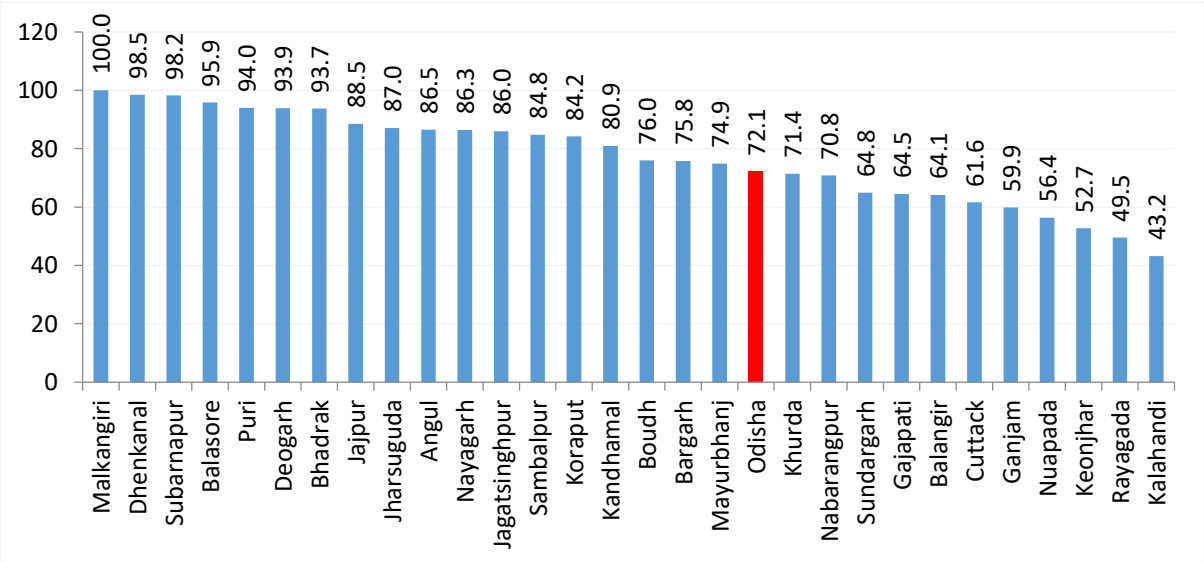
Figure 6 illustrates the district wise comparative information of annual collection per 100 population and number of blood banks per one million populations. This indicates that the state had around 1.9 blood banks per million population that collected around 0.9 units per 100 population at the ratio of 1.9 BB: 0.9 blood unit. The ratio is Sambalpur district which was 4.8:2.7 which indicates district collects relatively less blood with more number of blood banks proportionate to population. Whereas the ratios in Cuttack districts had 0.8:2.5 which indicates that district collects relatively more blood with less number of blood banks proportionate to population.

Figure 6 Annual Collection per 100 population Vs BBs per 1 million- District wise



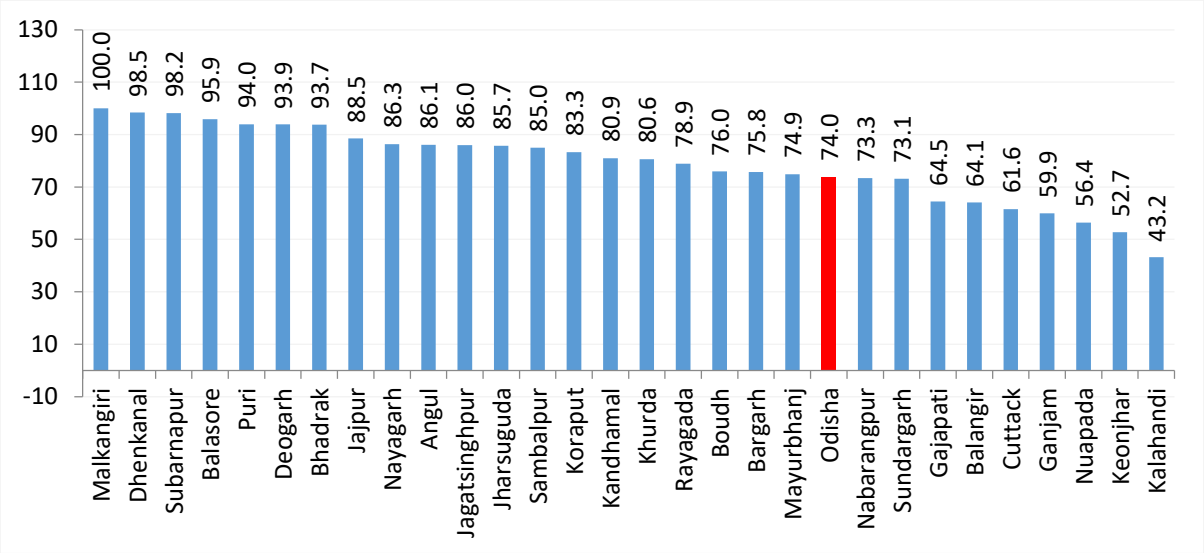
4.2.2 Voluntary blood donation: As depicted in Figure-7, 18 districts have recorded more than the state average of 72.1%. Districts such as Malkangiri recorded 100% Voluntary blood donation followed by Dhenkanal, Subarnapur, Balasore, Puri, Deogarh, Bhadrak, Jaipur, Jharsuguda, Angul, Nayagarh, Jagatsinghpur, Sambalpur, Koraput, Kandhamal, Boudh, Bargarh and Mayurbhanj reported more than the state percentage of voluntary blood donation. Five districts collected less than 60% of voluntary blood donation during January to December 2015.

Figure 7 -Percentage of Voluntary Blood Donation by District (Overall)



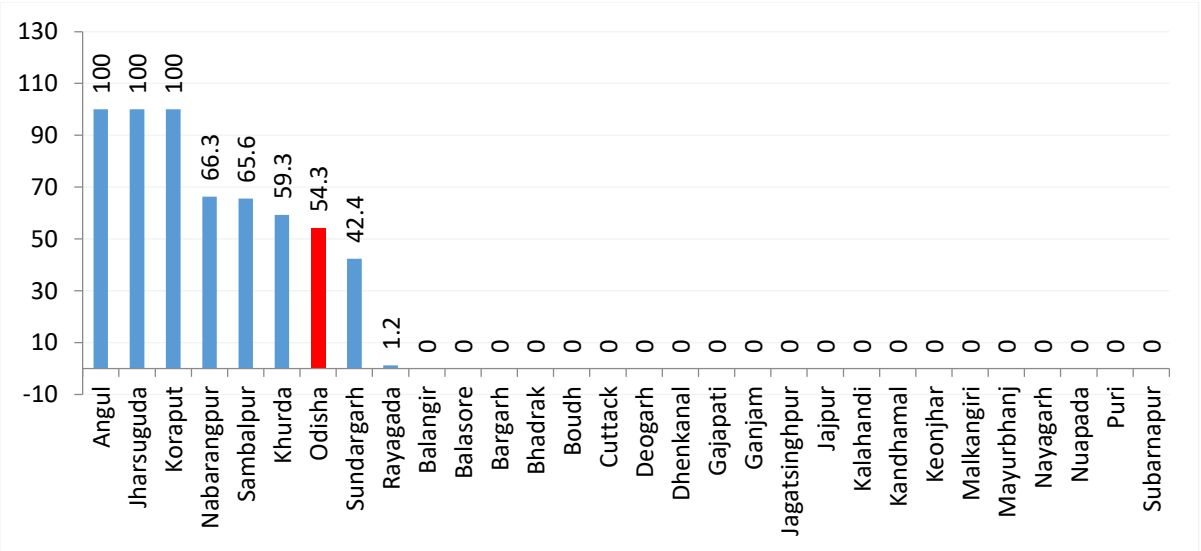
In terms of NACO supported blood banks, Majority of districts (20) have recorded a higher proportion of voluntary donation which is above the state average of 74%. Malkangiri recorded 100% Voluntary blood donation followed by Dhenkanal (98.5). Five districts such as Nabarangpur, Sundargarh, Gajapati, Balangir, Cuttack, Ganjam, Nuapada , Keonjhar and Kalahandi reported less than the State average.

Figure 8 Percentage of Voluntary Blood Donation by District (NACO Supported)



Among Non-NACO blood banks, Majority of the districts (23) are recorded less than the state average of 54.3%. Angul, Jharsuguda and Koraput reported 100% voluntary blood donation. Six districts such as Angul (100), Jharsuguda (100), Koraput (100), Nabarangpur (66.3), Sambalpur (65.6) and Khurda (59.3) recorded more than state average.

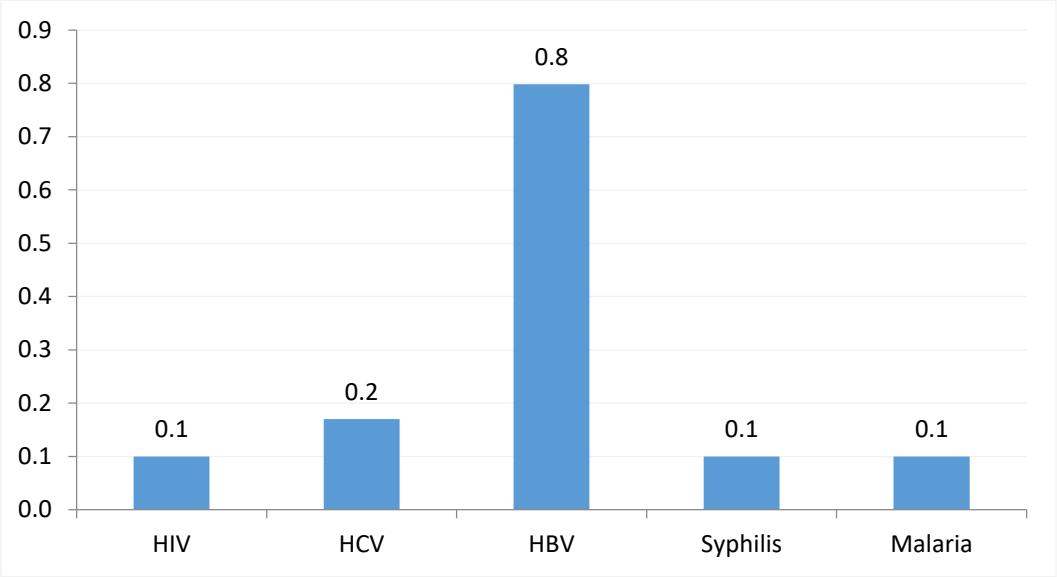
Figure 9 -Percentage of Voluntary Blood Donation by District (Non-NACO)



4.3 Transfusion Transmitted Infections(TTIs)

Transfusion-Transmitted Infections (TTIs) are major problems associated with blood transfusion (Chandra, Rizvi, & Agarwal, 2014; Gupta, Singh, Singh, & Chugh, 2011). Screening for TTIs such as HIV 1, HIV 2, Hepatitis B, Hepatitis C, Malaria, and Syphilis is mandatory in India. Due to the concerted and active efforts, the seroreactivity percentage of TTIs has come down significantly over the years.

Figure 10 Transfusions Transmitted Infection (%)-Jan-Dec 2015



The seroreactivity of TTI among blood donors in the year 2015 is depicted in Fig-10. HBV positivity was found to highest with 0.8%. HIV, Syphilis and Malaria has a similar level of positivity of 0.1% followed by HCV with 0.2 % of seroreactivity.

Though HIV, HCV and Malaria positivity rates did not indicate much difference between NACO and Non–NACO blood banks. Seroreactivity of all the Transfusion Transmitted Infections are higher in Non NACO as compared to NACO supported blood banks.

Table 8 - Transfusion Transmitted Infections (%)

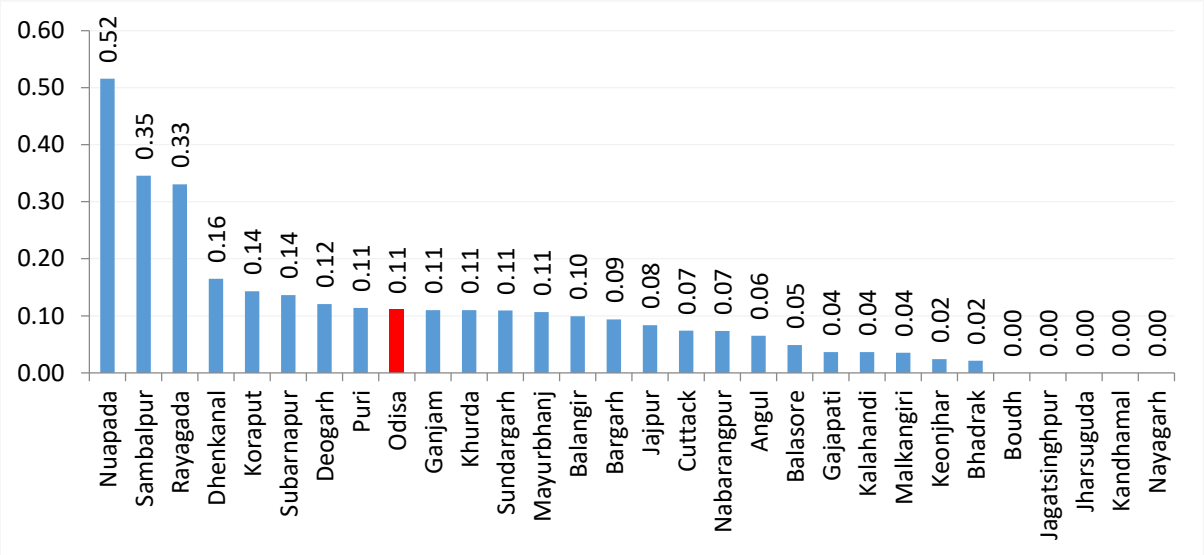
Category of BB	Transfusion Transmitted Infections %				
	HIV	HCV	HBV	Syphilis	Malaria
NACO Supported	0.1	0.2	0.8	0.1	0.1
Non-NACO	0.2	0.3	0.9	0.3	0.2
Overall	**0.1**	**0.2**	**0.8**	**0.1**	**0.1**

4.3.1 Transfusion Transmitted Infections by Category of blood banks: The blood banks with component facility indicate highest positivity of HIV (0.12), HCV (0.21) and Malaria (0.09). However HBV (1.04) and Syphilis (0.1) were found to be higher in blood banks without component facility compared to blood banks with component

Table 9-Transfusion Transmitted Infections by category of blood banks

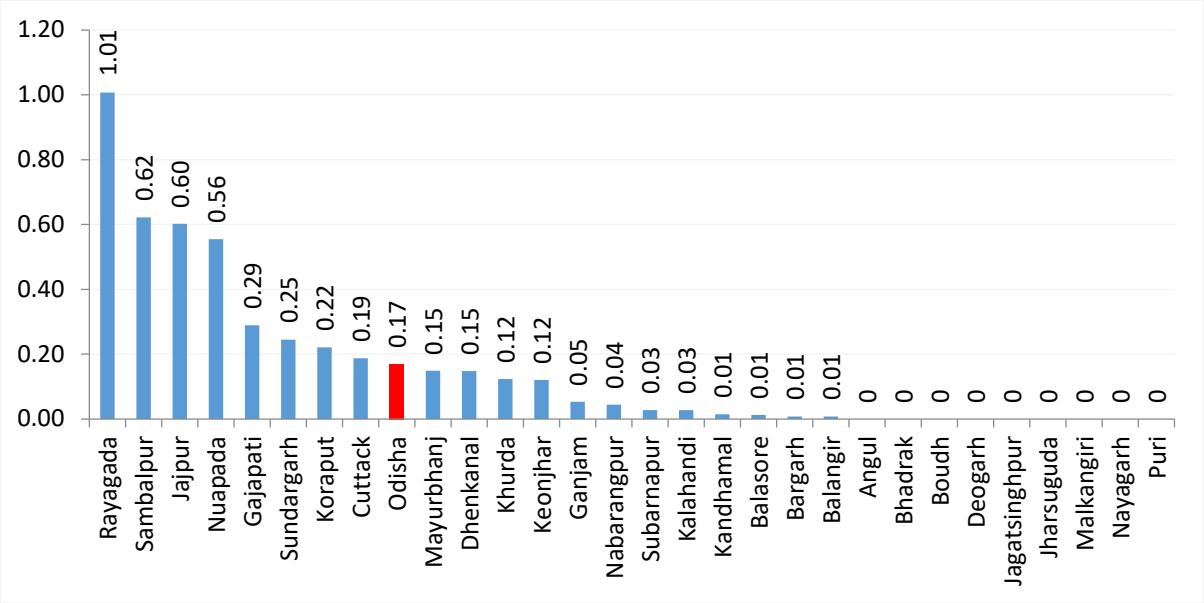
Category of BB	Transfusion Transmitted Infections %				
	HIV	HCV	HBV	Syphilis	Malaria
BBs with component facility	0.12	0.21	1.04	0.10	0.09
BBs without component facility	0.10	0.14	0.61	0.14	0.07
Overall	**0.11**	**0.17**	**0.80**	**0.13**	**0.08**

Figure 11 HIV Seroreactivity- By District (%)



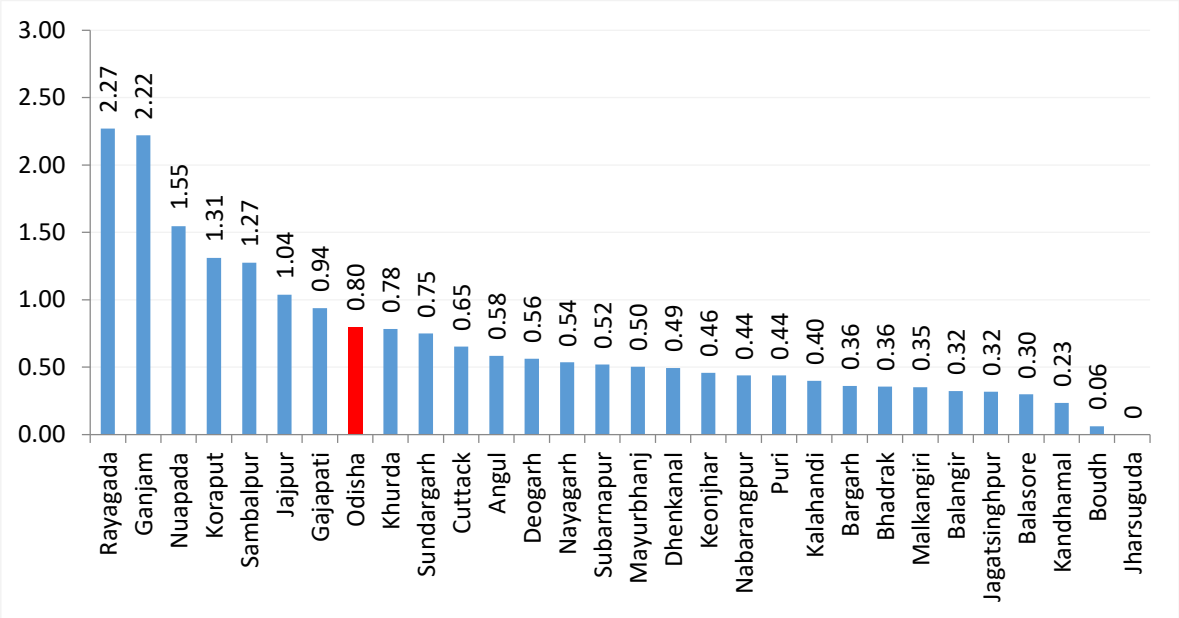
The majority of districts indicated lower HIV positivity than the state HIV positivity level of 0.11%. However, Nuapada (0.52), Sambalpur (0.35), Rayagada (0.33), Dhenkanal (0.16), Koraput (0.14), Subarnapur (0.14), Deogarh (0.12), Puri (0.11) recorded a higher positivity than state average.

Figure 12 HCV Seroreactivity- By District (%)



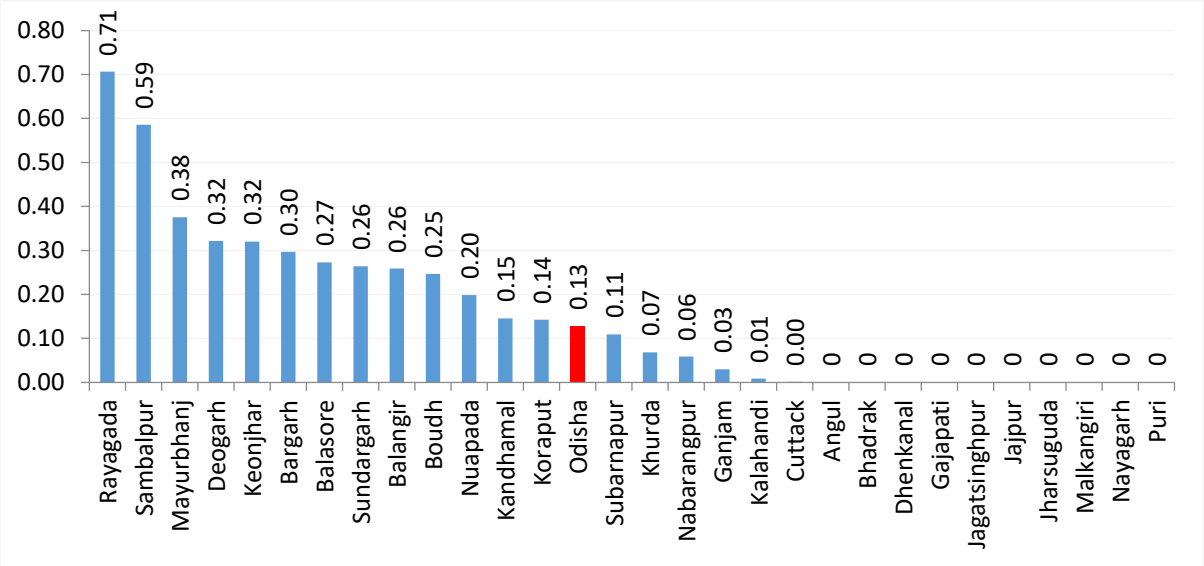
Hepatitis B seroreactivity was found to be higher than the state average of 0.80% in districts like Rayagada (2.27) followed by Ganjam (2.22), Nuapada (1.55), Koraput (1.31), Sambalpur (1.27), Jajpur (1.04), Gajapati (0.94). Majority of the districts (22) were recorded less than the state average.

Figure 13 HBV Seroreactivity- By District (%)



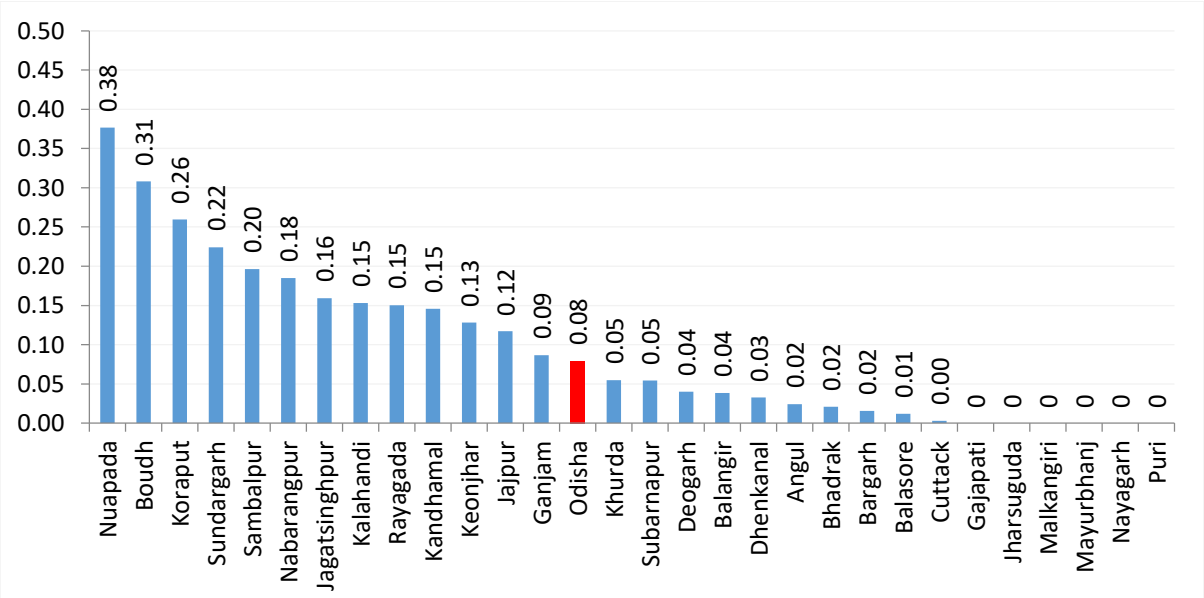
Syphilis seroreactivity was found to be higher than the state average of 0.13% in districts such as Rayagada, Sambalpur, Mayurbhanj, Deogarh, Keonjhar, Bargarh, Balasore, Sundargarh, Balangir, Boudh, Nuapada and Kandhamal. Sixteen districts recorded less than the state average.

Figure 14 Syphilis Seroreactivity- By District (%)



Malaria seroreactivity was found to be higher than the state average in districts such as Nuapada (0.38),Boudh (0.31), Koraput (0.26), Sundargarh (0.22), Sambalpur (0.20), Nabarangpur (0.18), Jagatsinghpur (0.16), Kalahandi (0.15), Rayagada (0.15), Kandhamal (0.15), Keonjhar (0.13), Jajpur (0.12). Sixteen districts recorded less than the state average.

Figure 15 Malaria Positivity- By District (%)



4.4 Component Separation

As depicted in Figure-16, around 16% of blood units collected by blood banks with component separation facilities were used for component separation in state. The percentage of component separation was higher (41.8%) in Non-NACO blood banks compared to NACO supported blood banks (13.4%).

Figure 16 Total Blood Collection and Component Separation

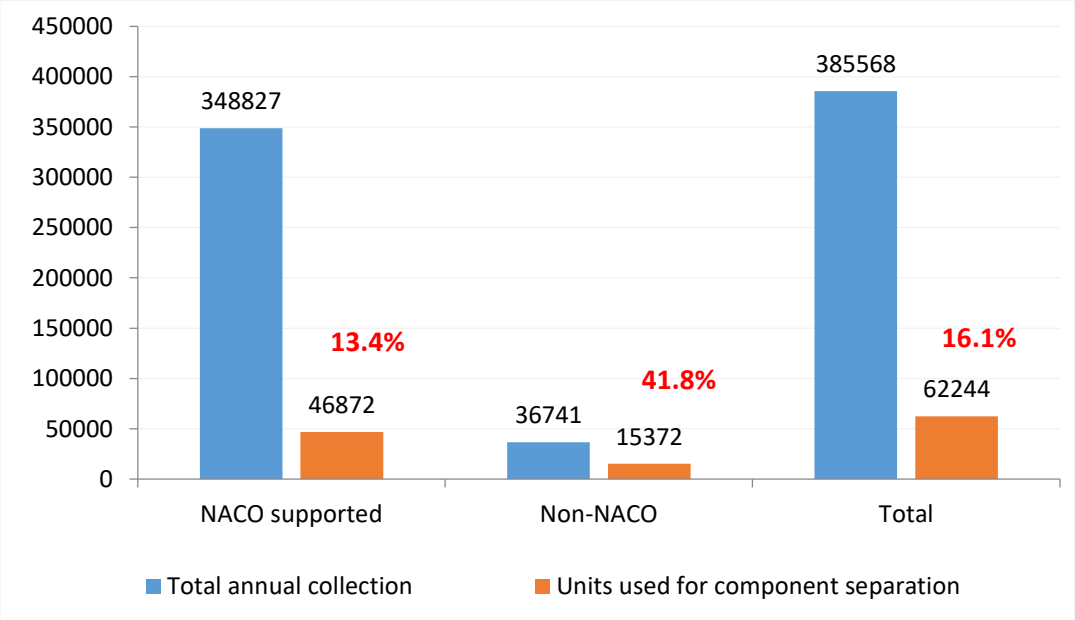


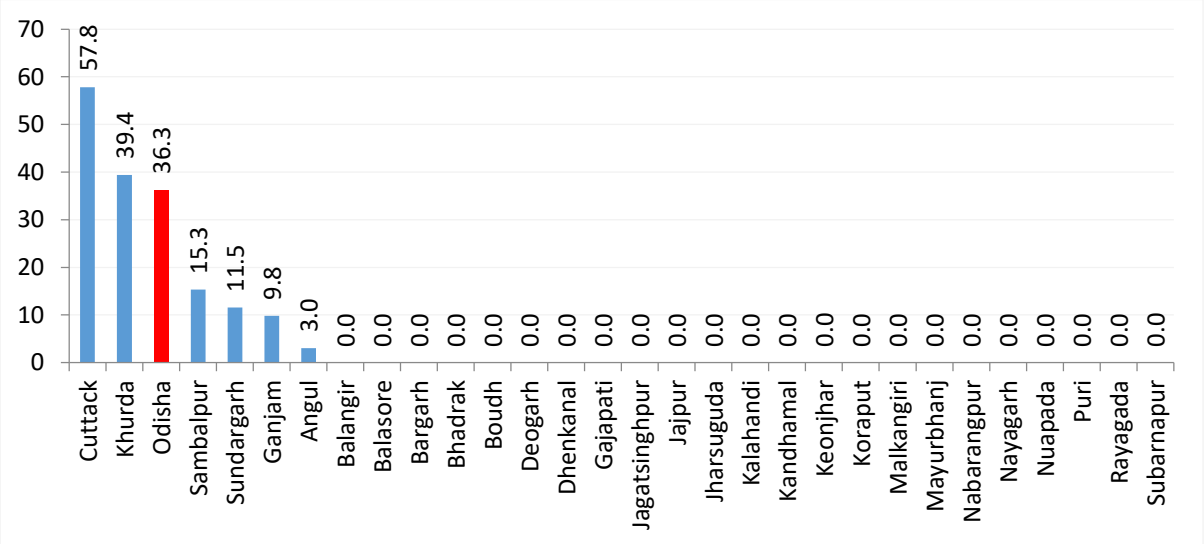
Table 10-Total Annual Collection by BCSUs and percentage of component separation

District	Total Annual Collection	Total Collection by BCSUs	Percentage of component separation
Angul	12327	11031	3.0
Balangir	12930	-	-
Balasore	16480	-	-
Bargarh	12814	-	-
Bhadrak	9546	-	-
Boudh	1623	-	-
Cuttack	66332	66332	57.8
Deogarh	2490	-	-
Dhenkanal	6074	-	-
Gajapati	2772	-	-
Ganjam	29969	26653	9.8
Jagatsinghpur	1885	-	-

Jajpur	5981	-	-
Jharsuguda	8319	-	-
Kalahandi	11089	-	-
Kandhamal	6867	-	-
Keonjhar	12485	-	-
Khurda	52930	44849	39.4
Koraput	7709	-	-
Malkangiri	2849	-	-
Mayurbhanj	14112	-	-
Nabarangpur	6838	-	-
Nayagarh	5607	-	-
Nuapada	5043	-	-
Puri	5261	-	-
Rayagada	6655	-	-
Sambalpur	28386	18158	15.3
Subarnapur	3663	-	-
Sundargarh	26532	4505	11.5
Odisha	**385568**	**171528**	**36.3**

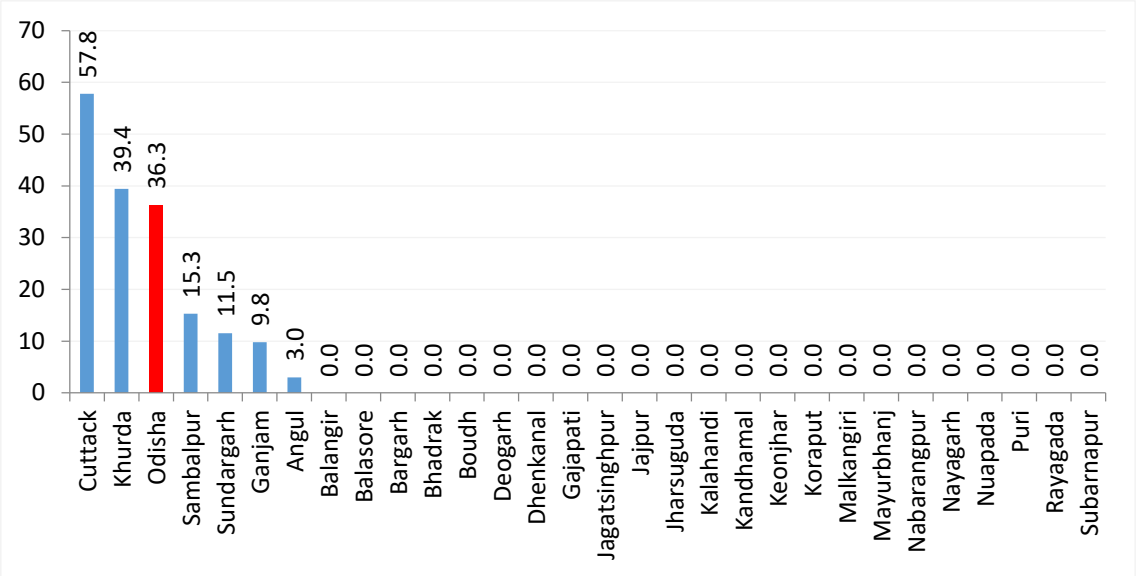
The percentage of component separation out of the total collection was more than 30% in Cuttack and Khurda.

Figure 17 Percentage of Component Separation- By District (All BBs)



The percentage of component separation in NACO supported blood banks is illustrated in Figure-18 which indicates majority of the districts were recorded less than State average and only two districts that is Cuttack (57.8) and Khurda (39.4) reported more than the state average.

Figure 18 Percentage of Component Separation- By District (NACO)



4.5 Quality Management Systems

Quality is defined as the totality of characteristics of an entity that bears on its ability to satisfy the stated and implied needs (Schlickman, 1998). It is a spectrum of activities and processes that shape the characteristics of a product or service. Quality systems are defined as the organizational structure, resources, processes, and procedures needed to implement quality management (ISO-8402, 1994) and Quality Management System is the sum total of all business policies, processes and procedures required for the execution of production, development or service of an organization.

Blood transfusion is a multi-step process with the risk of error in each process from selecting donors, collecting and processing donations, testing of donor and patient samples, issue of compatible blood, to transfusing the patient (WHO, 2016a). An effectively planned and implemented quality system that includes internal quality assessment, external quality assessment, and education and training of staff can significantly reduce the risk associated with blood transfusion.

The assessment captured several parameters that influence the quality of service provision. Some of the key parameters are mentioned in Table -11. The majority of blood banks (92.9%) reported that they adhered to the NBTC guidelines. Availability of document control system was reported by 42.9% of the blood banks in the state. Around 40% of NACO supported blood banks and 50.0% of Non-NACO blood banks reported they had a document control system. In terms of Standard Operating Procedures (SOPs) for technical processes, more than 92.9% reported that they had SOPs.

Table 11-Availability of Quality Parameters in Blood Banks

Quality Parameters	NACO/NON-NACO		All Blood Banks (n=70)
	NACO supported (n=54)	Non-NACO (n=16)	
Compliance with NBTC guidelines	49	16	65
	90.7%	100.0%	92.9%
Availability of Documental Control System (DCS)	22	8	30
	40.7%	50.0%	42.9%
SOPs for Technical Processes	49	16	65
	90.7%	100.0%	92.9%
IQC for IH	29	11	40
	53.7%	68.8%	57.1%
IQC for TTI	18	8	26
	33.3%	50.0%	37.1%
QC for kits, reagents and blood bags	38	14	52
	70.4%	87.5%	74.3%
EQAS for IH	-	3	3
	-	18.8%	4.3%
EQAS for TTI	-	1	1
	-	6.3%	1.4%
NABH accreditation for blood banks	-	-	-
	-	-	-
Availability of designated and trained Quality Manager	6	5	11
	11.1%	31.3%	15.7%
Availability of designated and trained Technical Manager	6	8	14
	11.1%	50.0%	20.0%
Programme for regular Equipment maintenance	33	15	48
	61.1%	93.8%	68.6%
Equipment calibration as per regulatory requirement	31	15	46
	57.4%	93.8%	65.7%

At the state level, Internal Quality Control (IQC) for Immunohematology was reported by 57.1% of the blood banks and IQC for TTIs was reported by 37.1% of the blood banks. Around 74% of the blood banks reported carrying out quality control for kits, reagents and blood bags. The percentage of blood banks enrolled in EQAS by recognized providers was found to be only 4.3% for immunohematology and 1.4% for TTIs. No Blood bank that participated in the assessment were accredited by National Accreditation Board for Hospitals & Healthcare Providers (NABH).

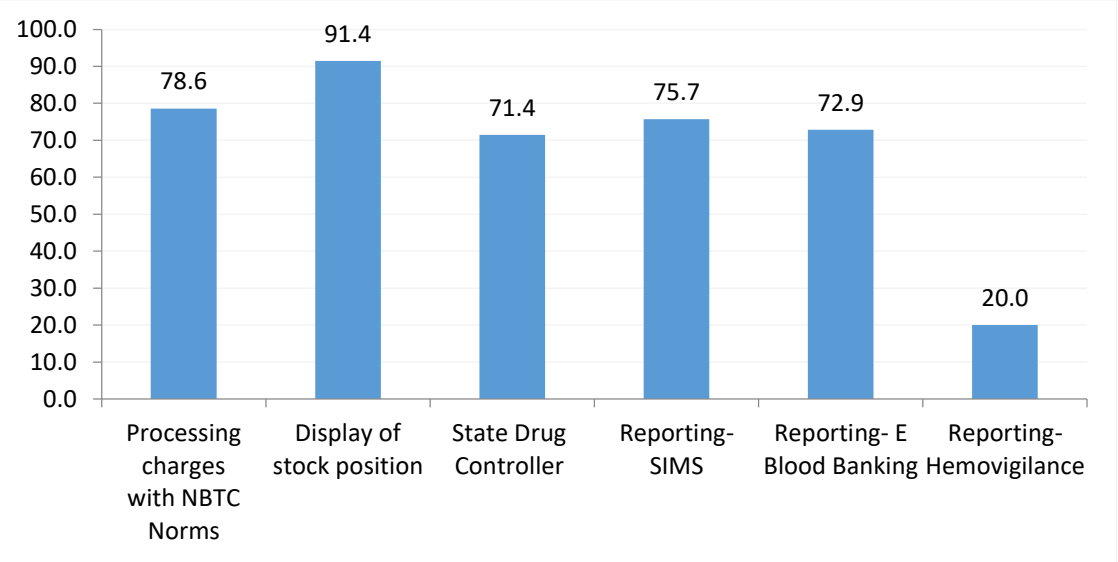
Designated and trained Quality Managers and Technical managers were available only in 15.7% and 20% of the blood banks respectively. More than 68.6% of the blood banks reported that they had a regular equipment maintenance programme and around 66% reported that they calibrate the equipment as per requirement.

4.6. Reporting and Documentation

4.6.1. Compliance to NBTC guidelines

Majority of the blood banks (92.9%) reported to be compliant with NBTC guidelines. Around, 79% of Blood Banks reported that they were recovering processing charges within NBTC/SBTC norms. Most of the blood banks (91.4%) reported that they were displaying stock position in their Blood bank Premises.

Figure 19 Reporting and Documentation



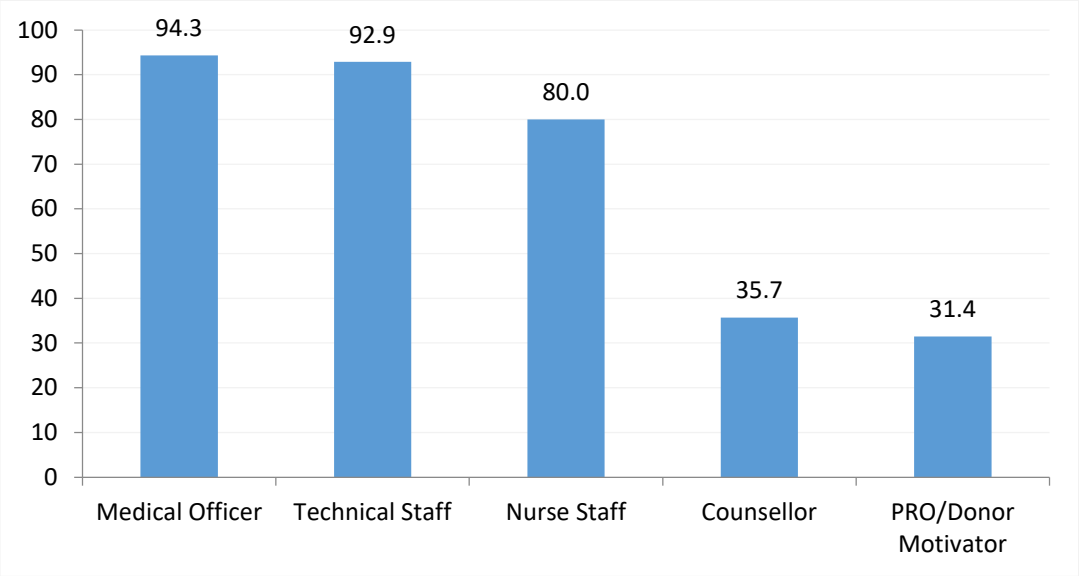
4.6.2 Reporting requirements: In terms of reporting requirement, 71.4% of the blood banks submitted regular reports to state drug controller, 75.7 % of blood banks regularly reported in national strategic information management systems (SIMS). However, only 72.9% regularly reported in E-blood banking either national or state e-blood banking. Only 20% of the Blood banks were members of National Haemovigilance Program.

4.7. Human Resources

4.7.1. Availability of staff

The mean number of employees in the blood bank was 10.7 (SD 7.6). It ranges from one employee to 42 employees. Around 94% of blood banks reported to have medical officers, 92.9% each had technical staff and 80% nursing staff. However, only 35.7% had counsellors and 31.4% reported to have PRO/Donor motivators.

Figure 18 Percentage of BB Manpower (At least one)



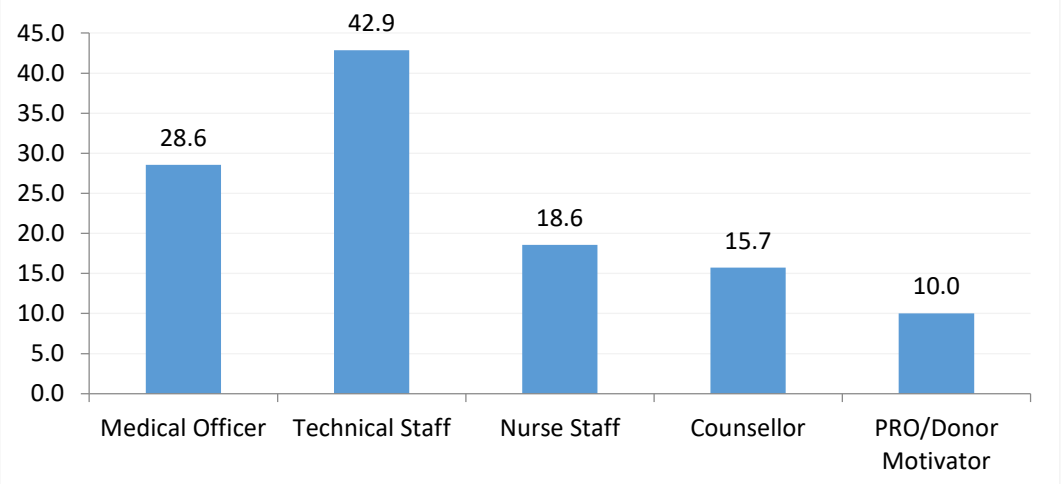
4.7.2. Availability of designated Quality and Technical Managers

Only 46 (51%) blood bank reported that they have quality manager and around 37% blood banks (33) reported to have a trained quality manager.

4.8. Training of Blood Bank Personnel

According to the assessment, around 28% of the blood banks reported that they had at least one medical officer trained by NACO/NBTC. Around 43% blood banks reported they had trained technical staff, 18.6% reported having trained nursing staff, 15.7% had trained counsellors and 10% had trained PRO/donor motivator.

Figure 19 Percentage of At least one trained

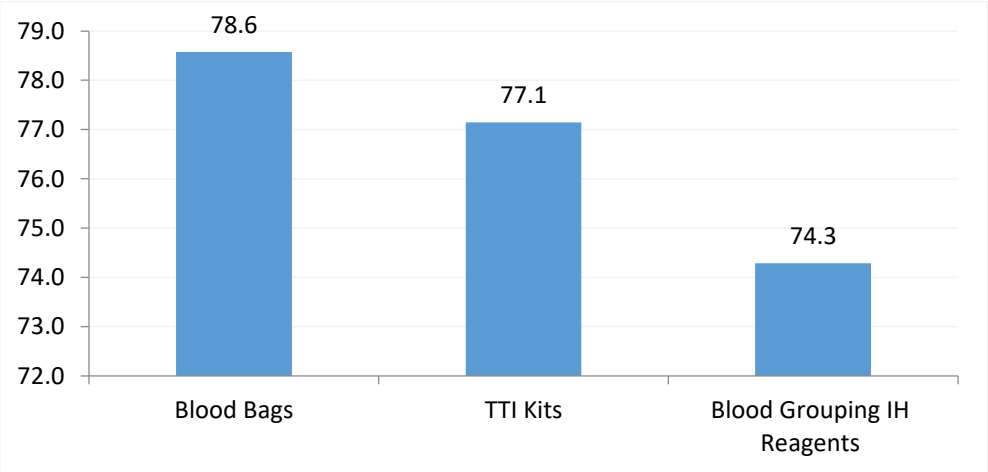


4.9. Equipment and Supplies

4.9.1. Regular supply kits/supplies

Majority of blood banks (78.6%) reported that they had regular supply of blood bags, 77.1% reported that they had regular supply of kits and 74.3% reported to have regular supply of blood grouping reagents.

Figure 20 Regular Supply of Kits



4.9.2. Equipment Availability (working condition)

Table 12 indicates the percentage of blood banks that have different equipment in working condition.

Table 12 - BBs having Equipment in working condition

BBs having Equipment in Working Condition		
S No	**Equipment**	**% BB**
1	Donor Couches	92.9
2	Instrument for Hb Estimation	90.0
3	Blood collection monitor	94.3
4	Quarantine Blood Bank Refrigerator to store untested blood	91.4
5	Container for safe disposal of sharps	90.0
6	Oxygen supply equipment	95.7
7	Computers with accessories and software	88.6
8	General lab centrifuge for samples	88.6
9	Bench top centrifuge for serological testing (Immunohaematology)	67.1
10	Blood transportation box (No. in inventory)	82.9
11	Emergency drugs box / Crash cart	95.7
12	Autoclave machine	85.7
13	Water bath	58.6
14	Blood bank refrigerator (storage of tested blood) with temperature recorder	97.1
15	Automated pipettes	75.7
16	Refrigerated centrifuge	20.0
17	Blood container weighting device	57.1
18	Serology rotator	28.6

4.10. The current status of blood banks based on the assessment

As mentioned in the methodology section, the blood banks were assessed and categorized based on the scores obtained. Though the assessment captured all the aspects of blood transfusion services in blood banks, adequate importance and weightage were given to the technical aspects and adherence to quality management systems.

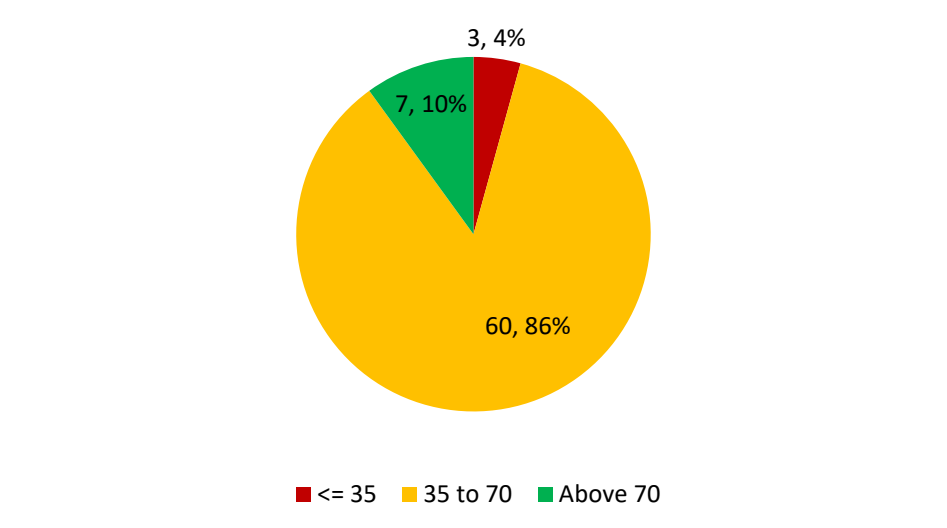
The mean assessment score of blood banks in the state was 56.70 (SD: 11.58). The Non NACO blood banks scored slightly higher 58.75 (SD: 10.79) than the Non-NACO blood banks.

Table 13- Mean Assessment score

Type of BB	N	Mean	SD
NACO supported	54	56.09	11.83
Non-NACO	16	58.75	10.79
Total	**70**	**56.70**	**11.58**

At the state level, the majority of blood banks (60; 86%) scored between 35 to 70, followed by (7; 10%) which scored above 70, and only three blood bank scored less than or equal to 35.

Figure 21 Categorisation of Blood banks (n=70)



There are 87% of Non NACO and 85 NACO supported blood banks scored between 35 and 70. Around, 13% of Non-NACO blood banks and 9% of NACO supported blood banks scored more than 70%. (Refer Figure 22; Figure 23). In terms of score below 35 there were five NACO supported blood bank and two Non-NACO supported blood banks.

Figure 23 Categorisation of NACO Supported BBs (n=54)

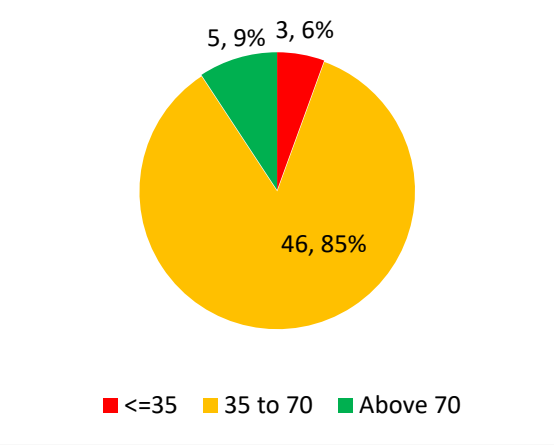
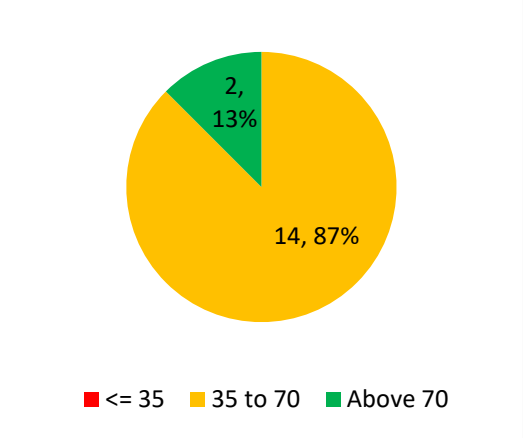
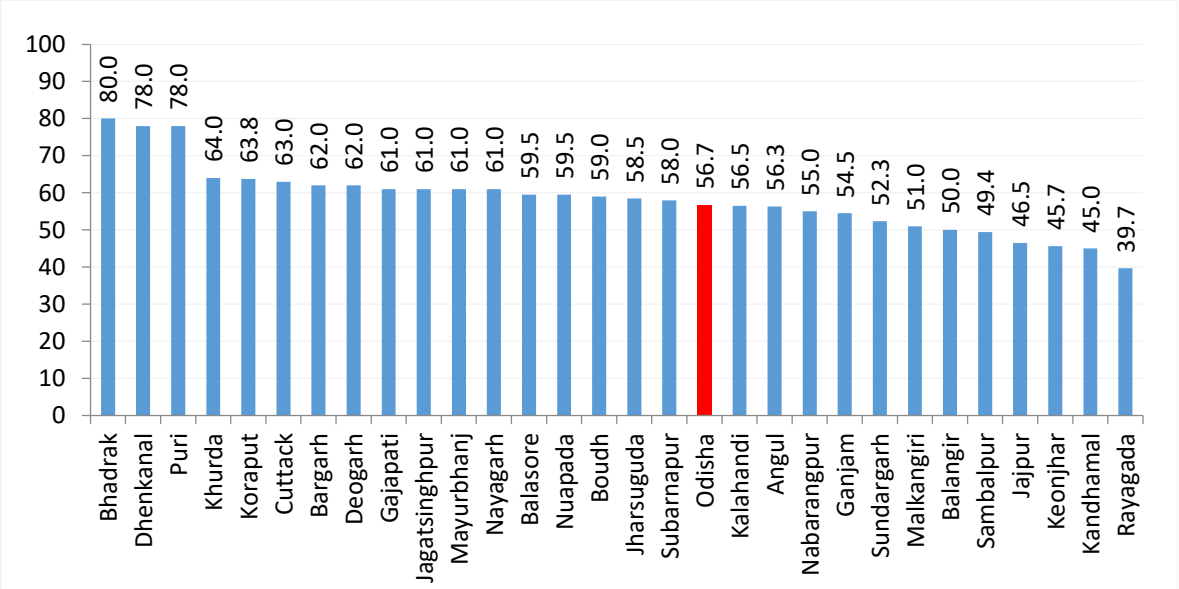


Figure 22 Categorisation of Non-NACO BBs (n=16)



Among the districts, Bhadrak (80) scored the highest and Rayagada (39.7) scored the least. There were 17 districts which scored higher than the state average of 56.7.

Figure 24 Mean Assessment Score – By Districts (All BBs)



The mean scores of NACO supported blood banks were higher than the Non-NACO blood banks in 2 districts which are Khurda and Koraput.

The mean scores of Non-NACO supported blood banks were higher than the NACO blood banks in 4 districts. The difference in the score ranges from 0.5 to 19. Angul has highest difference of 19 followed by Rayagada with difference of 6.5. Jharsuguda has lowest difference of 0.5.

Table 14-Mean assessment score - By District (NACO supported Vs. Non-NACO)

District	NACO supported	Non-NACO	Total
Angul	50.0	69.0	56.3
Balangir	50.0	-	50.0
Balasore	59.5	-	59.5
Bargarh	62.0	-	62.0
Bhadrak	80.0	-	80.0
Boudh	59.0	-	59.0
Cuttack	63.0	-	63.0
Deogarh	62.0	-	62.0
Dhenkanal	78.0	-	78.0
Gajapati	61.0	-	61.0
Ganjam	54.5	-	54.5
Jagatsinghpur	61.0	-	61.0
Jajpur	46.5	-	46.5
Jharsuguda	58.0	59.0	58.5
Kalahandi	56.5	-	56.5
Kandhamal	45.0	-	45.0
Keonjhar	45.7	-	45.7
Khurda	65.7	63.2	64.0
Koraput	64.0	63.5	63.8
Malkangiri	51.0	-	51.0
Mayurbhanj	61.0	-	61.0
Nabarangpur	43.0	67.0	55.0
Nayagarh	61.0	-	61.0
Nuapada	59.5	-	59.5
Puri	78.0	-	78.0
Rayagada	37.5	44.0	39.7
Sambalpur	49.0	51.0	49.4
Subarnapur	58.0	-	58.0
Sundargarh	56.7	48.0	52.3
Odisha	**56.1**	**58.8**	**56.70**

Only three blood bank from Kandhamal, Rayagada and Sambalpur district scored less than or equal to 35. The number of blood banks (by district) that scored more than 70 is mentioned in Table-16. Of the 7 blood banks that scored more than 70 score, 5 (71.4 %) were NACO supported blood banks. The majority of blood banks that scored above 70 were from. Khurda which had 3 blood banks constituting around 43 % of the total blood banks that scored more than 70.

Table 15 -Number of Blood Banks Scored 35 to 70 - by District

District	NACO	Non NACO	Total
Kandhamal	1	-	1
Rayagada	1	-	1
Sambalpur	1	-	1
Odisha	**3**	**-**	**3**

Table 16-Number of Blood Banks Scored above 70- by District

District	NACO	Non NACO	Total
Bhadrak	1	-	1
Dhenkanal	1	-	1
Khurda	1	2	3
Mayurbhanj	1	-	1
Puri	1	-	1
Odisha	**5**	**2**	**7**

4.10.1 Assessment score by Category of blood banks: The mean score of blood banks with component facilities (62; SD: 8.93) was found to be higher than the mean score of those without component facilities (55.60; SD: 11.83).

Table 17-Mean assessment score by category of blood banks

Type of Blood Bank	NACO Supported			Non-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
BCSUs	6	61.00	4.77	6	63.00	12.25	12	62.00	8.93
Without Component facility	48	55.48	12.33	10	56.20	9.55	58	55.60	11.83

The blood banks that scored <=35 was only three blood bank without component separation facility. (Refer figure 26 and 30). 86% of blood banks without component facility scored between 35 to 70, as compare to 83% of blood banks with component facility. 17% of blood banks with component preparation facility scored more than 70, as compared to 9 % of blood banks without component facility.

Figure 26 BBs with Component-Score (n=12)

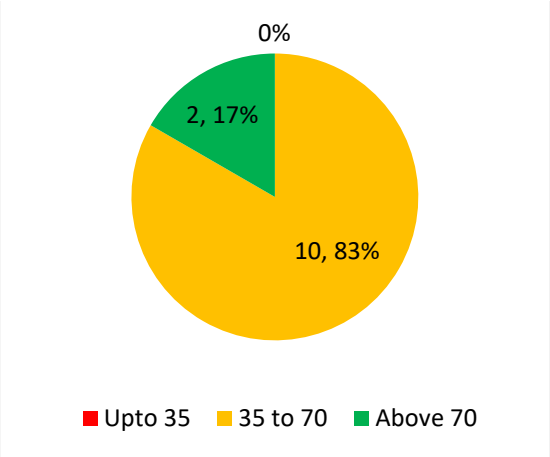
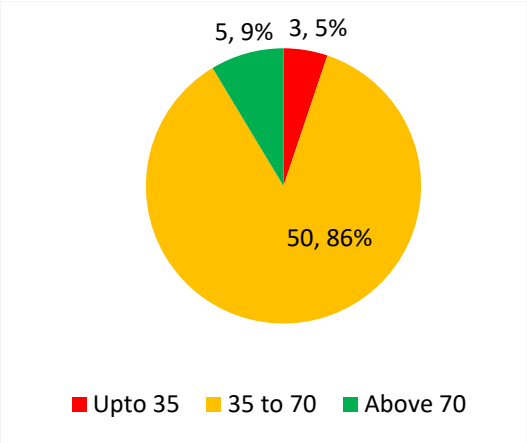


Figure 25 BBs without Component-Score (n=58)



4.10.2 Assessment score by Ownership: The mean assessment score of private owned blood banks (65.00; SD:12.41) was found to be higher than the NGO/Trust/Charitable (56.40; SD: 11.85) and public owned blood banks (55.91; SD: 11.28) (Refer Table 18).

Table 18-Mean assessment score by Ownership

Ownership	NACO supported			Non-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
NGO/Trust/ charitable	13	58.00	13.20	7	53.43	8.98	20	56.40	11.85
Private	0	-	-	5	65.00	12.41	5	65.00	12.41
Public	41	55.49	11.48	4	60.25	9.00	45	55.91	11.28

Table 19 Mean assessment scores categories by Ownership

Ownership	<=35	36 to 70	Above 70	Total
Public	-	3	2	5
	-	60 %	40%	100 %
NGO/Trust/Charitable	1	17	2	20
	5 %	85 %	10 %	100%
Private	2	40	3	45
	4.4 %	88.9 %	6.7 %	100%
Overall	**3**	**60**	**7**	**70**
	4.3 %	**85.7%**	**10%**	**100%**

4.10.3 Assessment score of Private Sector Blood Banks: Irrespective of the NACO support status, 35.7% (25) blood banks were owned by private sector, of which, 80% (20) were owned by not-for-profit sector such as, NGO, Trust, and charitable organizations. The mean score of private sector owned blood banks including not-for-profit sector was 58.12 (SD: 12.22) the mean score of public owned blood banks was 55.91 (11.28). Among the private sector, the private sector (65.00; SD: 12.41) scored slightly higher than the other not-for-profit blood banks (56.40; SD: 11.85).

Nevertheless, it is also important to note that the average annual collection was higher (5920 units) in public owned blood banks compared to private blood banks (5003 Units). Similarly, the percentage of voluntary blood donation was higher in public owned blood banks (77.2%) compared to the private blood banks (61.4 %). Both private and public sector blood bank had the same number of component seperation facility with 6 blood banks.

4.10.4 Assessment score by Annual Collection: The mean assessment score of blood banks that collected more than 5000 blood units (62.25; SD: 10.73) was found to be higher than those which collected between 3001 to 5000 (57.53; SD: 9.86) and less than 3000 blood units (52.61; SD: 11.69).

Table 20 -Mean assessment score by annual collection

Annual Collection	NACO supported		Non-NACO		Total	
	Mean	SD	Mean	SD	Mean	SD
Up to 3000	50.50	12.09	57.25	9.74	52.61	11.69
3001 to 5000	54.27	6.57	66.50	12.79	57.53	9.86
Above 5000	62.90	10.54	48.50	-	62.25	10.73

4.10.5 Assessment score by Voluntary Blood Donation: Table -20 provides the mean assessment score of blood banks that have been categorized by percentage of voluntary blood donation. The blood banks that reported higher proportion of voluntary blood donation indicated higher mean assessment score. Non-NACO supported blood bank have scored higher than NACO supported blood bank except in category of 50 to 70.

Table 21 -Mean assessment score by voluntary blood donation

% VBD	NACO supported		Non-NACO		Total	
	Mean	SD	Mean	SD	Mean	SD
Less than 25	48.50	9.19	55.58	12.22	53.81	11.38
25 to 49	52.60	3.58	-	-	52.60	3.58
50 to 74	50.75	11.25	56.67	8.96	51.93	10.81
75 to 90	53.65	11.66	-	-	53.65	11.66
Above 90	65.80	9.49	63.92	10.69	65.26	9.61

4.10.6 Assessment score by participation in External Quality Assessment Scheme (EQAS) for Immunohematology and Transfusion Transmitted Infections (TTI)

The mean score was found to be higher among the blood banks that were part of EQAS for immunohematology (66.00; SD: 19.29) as compared to those who were not enrolled (56.28; SD: 11.17). Similar situation was found among those blood banks that were part of EQAS for Transfusion-Transmitted Infections (80.00; SD: 0) as compared to those who were not enrolled (56.36; SD: 11.31).

There were only 3 Non-NACO blood banks were enrolled in IH- EQAS and one Non-NACO blood bank which was enrolled in TTI-EQAS. There were no NACO supported blood banks enrolled for EQAS-IH or EQAS TTI.

Table 22- Mean assessment score by EQAS enrolment

IH-EQAS	NACO supported			Non-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
YES	0	-	-	3	66.00	19.29	3	66.00	19.29
NO	54	56.09	11.83	13	57.08	8.20	67	56.28	11.17
TTI-EQAS									
YES	0	-	-	1	80.00	-	1	80.00	-
NO	54	56.09	11.83	15	57.33	9.50	69	56.36	11.31

4.10.7 Assessment score by Accreditation status: There were no blood banks that were accredited by National Accreditation Board of Hospitals and Health care Providers (NABH).

Table 23-Mean assessment score by Accreditation

NABH Accreditation	NACO supported			Non-NACO		
	N	Mean	SD	N	Mean	SD
YES	0	-	-	0	-	-
NO	54	56.09	11.83	16	58.75	10.79

The list of blood banks under different categories of score is given in Table- 24 and 25.

Table 24-Distribution of Blood banks by Districts and mean assessment score categories

Score Category				
District	**Upto 35**	**35 to70**	**Above 70**	**Total**
Angul	-	3	-	3
Balangir	-	4	-	4
Balasore	-	2	-	2
Bargarh	-	2	-	2
Bhadrak	-	-	1	1
Boudh	-	1	-	1
Cuttack	-	2	-	2
Deogarh	-	1	-	1
Dhenkanal	-	-	1	1
Gajapati	-	1	-	1
Ganjam	-	2	-	2
Jagatsinghpur	-	1	-	1
Jajpur	-	2	-	2
Jharsuguda	-	2	-	2
Kalahandi	-	2	-	2
Kandhamal	1	1	-	2
Keonjhar	-	3	-	3
Khurda	-	6	3	9
Koraput	-	4	-	4
Malkangiri	-	1	-	1
Mayurbhanj	-	2	1	3
Nabarangpur	-	2	-	2
Nayagarh	-	1	-	1
Nuapada	-	2	-	2
Puri	-	-	1	1
Rayagada	1	2	-	3
Sambalpur	1	4	-	5
Subarnapur	0	1	-	1
Sundargarh	0	6	-	6
Odisha	**3**	**60**	**7**	**70**

Table 25 - Distribution of Blood banks by Districts and mean assessment score categories

District	Score Category					
	NACO supported			Non-NACO		
	Up to 35	35 to 70	Above 70	Up to 35	35 to 70	Above 70
Angul	-	2	-	-	1	-
Balangir	-	4	-	-	-	-
Balasore	-	2	-	-	-	-
Bargarh	-	2	-	-	-	-
Bhadrak	-	-	1	-	-	-
Boudh	-	1	-	-	-	-
Cuttack	-	2	-	-	-	-
Deogarh	-	1	-	-	-	-
Dhenkanal	-	-	1	-	-	-
Gajapati	-	1	-	-	-	-
Ganjam	-	2	-	-	-	-
Jagatsinghpur	-	1	-	-	-	-
Jajpur	-	2	-	-	-	-
Jharsuguda	-	1	-	-	1	-
Kalahandi	-	2	-	-	-	-
Kandhamal	1	1	-	-	-	-
Keonjhar	-	3	-	-	-	-
Khurda	-	2	1	-	4	2
Koraput	-	2	-	-	2	-
Malkangiri	-	1	-	-	-	-
Mayurbhanj	-	2	1	-	-	-
Nabarangpur	-	1	-	-	1	-
Nayagarh	-	1	-	-	-	-
Nuapada	-	2	-	-	-	-
Puri	-	-	1	-	-	-
Rayagada	1	1	-	-	1	-
Sambalpur	1	3	-	-	1	-
Subarnapur	-	1	-	-	-	-
Sundargarh	-	3	-	-	3	-
Odisha	**3**	**46**	**5**	**-**	**14**	**2**

5. Conclusion

Considering the importance of blood transfusion services in the provision of medical care, ensuring quality systems and standards in blood banks are vital, as the blood and its products must not only be safe but also clinically effective and of appropriate and consistent quality. From the programmatic perspective, adequate, accurate and updated information at the district, state and national level is essential for planning and implementation of quality management systems in blood transfusion services across the country. Generation of accurate and essential data from blood banks at regular intervals is imperative to effectively monitor the progress, gaps and challenges in the service provision which would not only facilitate appropriate corrective measures but also facilitate the development of evidence-based policies and programmes.

This state-wide assessment captured most of the required information related to the structure, services, facilities, availability of human resources, equipment, quality management system and practices in blood banks across the state. All blood banks in Kerala function subject to obtaining and maintaining a license for operations from the FDA which means compliance to basic quality standards mentioned in the Drugs and Cosmetic Act 1940 and Rules 1945 there upon. However, this assessment brings out specific gaps and possible opportunities to improve quality standards in Transfusion Services at the state.

The 58 NACO supported and 21 Non-NACO blood banks which were included in the review. The annual collection of these blood banks was 385,568 units which is approximately 91.8% of the total blood requirement based on WHO's estimation that blood donation by 1% of the population can meet a nation's most basic requirements for blood (WHO, 2010). However, there is a huge variation between districts that ranges from 0.1 units to 2.7 units per 100 population. Clinical demand for blood and blood products can happen only when there is a health care facility with adequate infrastructure in proximity to a blood bank. The relatively lower collection of blood in the few districts could be due to the fact that there is lower demand for blood because of the gaps in availability, accessibility, and affordability of health care services.

The review also revealed that blood banks with component separation facility collected (44.5%) of blood units (171,528) and the remaining 55.5% (214,040) were collected by blood banks without the component facility. Though there has been an increase in the percentage of voluntary blood donation over the years ,there is still a huge variation between districts that ranges from 43 to 100%. A targeted program to increase the non-remunerated voluntary blood donors will go a long way towards ensuring a safer option for our patients.

It is also evident that the distribution of blood banks is skewed with 66% of the all the blood banks in the state relegated to only 11 districts. Around 16 districts have less than the state average of 1.9 blood banks per million population. The potential impact of this distribution of blood banks and collection of blood on other health indices may be further studied.

Around 705 of the blood banks having their licensing status in pendency may be an indication of an opportunity to strengthen the regulatory system by modern technological modalities to ensure a standardized, timely and transparent licensing process. It is also essential to review and update the regulatory framework to keep up with recent scientific developments and modernize the transfusion practice in the state.

The provision of a blood component separation unit in the blood bank and the volume of collection apparently have a positive influence on the quality. The inequity in the distribution of component separation facilities across districts and region is very evident. However, it is important to note that in the absence of reliable laboratory support, it will not be possible to ensure rational use of blood and its components. It is difficult to sustain cost-effective component production when the volume of operations is low without compromising the quality of the blood provided to the patients who access this service. Given that the provision of safe and high-quality blood in areas where access is a challenge is still the remit of the state, it is essential to explore new cost effective innovative methods in partnership with non-governmental agencies.

For the first time, a quality score system has been created and applied to the blood banks. This review indicated a mean score of 56.70 with significant variations across the category of blood banks, ownership, voluntary blood donation, participation in proficiency testing (EQAS) and accreditation status. It is important to understand that there is a huge variation between districts on several parameters included in the assessment. This suggests the need for targeted and customized approach to address the gaps and challenges faced by the blood banks in the state. This assessment suggests that blood banks owned by trusts/charities in the private sector seemed to have performed slightly better in the quality parameters. This may be partly due to access to resources, both financial and technical, to enhance capacity and modern technology to overcome potential barriers to quality.

It is evident from the assessment that blood banks that focussed on quality improvement systems performed better than others. Considering the deleterious effect of poor quality practices on patient care, it is imperative that specific programmes and strategies to improve quality systems in blood transfusion services are developed and implemented across the state.

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7. Annexures

7.1 Individual Blood Banks Summary

District	Name of the Blood Bank	Type	Ownership	Annual Collection	Score (Out of 100)
Angul	Orissa Red Cross Blood Bank Angul	BCSU	Public	11031	61
	Odisha Red Cross Blood Bank, Athamallik Angul	Non-BCSU	NGO/Trust/ Charitable	942	39
	N. S. Central Hospital	Non-BCSU	Public	354	69
Balangir	Red Cross Blood Bank, Balangir	Non-BCSU	Public	6351	41
	Orrisa Red Cross Blood Bank,Balangir	Non-BCSU	Public	3215	55
	Odisa Red Cross Blood Bank Patnagarh Dist Bolangir	Non-BCSU	Public	2200	57
	Biju Padhnaik Red Cross Blood Bank CHC Kantabanji	Non-BCSU	Public	1164	47
Balasore	Red Cross Blood Bank,Dist H.Qr Hospital,Balasore	Non-BCSU	Public	15461	58
	O.R.C.BB S.D.H, Nilagiri, Balasore	Non-BCSU	Public	1019	61
Bargarh	Orissa Red Cross Blood Bank Bargarh	Non-BCSU	NGO/Trust/ Charitable	10606	58
	Odisha Red Cross Blood Bank, SDH, Padampur	Non-BCSU	Public	2208	66
Bhadrak	Odisha Red Cross Blood Bank, Bhadnak	Non-BCSU	Public	9546	80
Boudh	Orissa Red Cross Blood Bank, Dist. Headquarter Hospital, Boudh	Non-BCSU	NGO/Trust/ Charitable	1623	59
Cuttack	Central Red Cross Blood BAnk Cuttack	BCSU	NGO/Trust/ Charitable	42197	66
	S.C.B M.C.H, Cuttak	BCSU	Public	24135	60
Deogarh	Red Cross Blood Bank, Dist. HQ	Non-BCSU	Public	2490	62

	Hospital, Deogarh				
Dhenkanal	Odisha Red Cross Blood Bank,Dhenkanal	Non-BCSU	NGO/Trust/ Charitable	6074	78
Gajapati	Odisha Red Cross Blood, Paralakhemundi	Non-BCSU	NGO/Trust/ Charitable	2772	61
Ganjam	Medical Officer Incharge Red Cross Blood Bank, MKCG-MCH, Berhmapur	BCSU	Public	26653	55
	Red Cross Blood Bank, S.D.H Hospital, Bhanjanagar	Non-BCSU	NGO/Trust/ Charitable	3316	54
Jagatsinghpur	Odisha Red Cross Blood Bank,DHH,Jagatsinghpur	Non-BCSU	Public	1885	61
Jajpur	Red Cross Blood Bank DHH Jajpur	Non-BCSU	Public	4892	54
	ORCBB CHC, Jajpur Road	Non-BCSU	Public	1089	39
Jharsuguda	Odisha Red Cross Blood Bank	Non-BCSU	Public	7551	58
	Tata Refractories Limited	Non-BCSU	Private	768	59
Kalahandi	Dr Sidheswar Marandi,Kalahandi	Non-BCSU	NGO/Trust/ Charitable	8975	56
	RCBB, SDH Dharmagarh	Non-BCSU	Public	2114	57
Kandhamal	Odisha Red Cross Blood Bank DHH Phulbani Dist-Kandhamal , Odisha	Non-BCSU	NGO/Trust/ Charitable	6089	59
	ORCBB, SDH, Balliguda	Non-BCSU	Public	778	31
Keonjhar	ORC Blood Bank, Keonjhar	Non-BCSU	Public	9510	45
	Red Cross Blood Bank Anandpur	Non-BCSU	Public	1866	50
	ORC Blood Bank, Champua	Non-BCSU	Public	1109	42
Khurda	AIIMS Blood Bank	Non-BCSU	Public		53
	Red Cross Blood Bank Capital Hospital	BCSU	Public	22054	57

	Sum Hospital Blood Bank	BCSU	Private	9339	48.5
	IRCS Red Cross Blood Bank, BMC Hospital, BBSR,Khundha	Non-BCSU	Public	5786	76
	Kalinga Hospital Limited	BCSU	Private	4552	80
	Apollo Hospitals Bhubaneswar	BCSU	Private	4297	74
	Hi-Tech Medical College & Hospital Blood Bank,Pandra,Rasulgarh Bhubnedhwar	BCSU	NGO/Trust/ Charitable	3311	60
Khurda	ORCBB, DHH, Khurda	Non-BCSU	Public	2295	64
	Blood Bank Amri Hospitals Ltd,Bhubaneshwar	BCSU	Private	1296	63.5
Koraput	Odisha Red Cross Blood Bank,Koraput	Non-BCSU	Public	4013	67
	Red Cross Blood Bank	Non-BCSU	Public	3285	61
	HAL Hospital Blood Bank	Non-BCSU	Public	272	67
	Asha Kiran Hospital	Non-BCSU	NGO/Trust/ Charitable	139	60
Malkangiri	Odisha Red Cross Blood Bank, D.H.H, Malkangiri	Non-BCSU	Public	2849	51
Mayurbhanj	ORCBB, DHH, Baripada	Non-BCSU	Public	8034	76
	Odisha Red Cross Blood Bank, Karanjia, Mayurbhanj	Non-BCSU	NGO/Trust/ Charitable	3619	53
	ORC BB SDH Rairangpur	Non-BCSU	Public	2459	54
Nabarangpur	ORCBB, DHH, Nabarangpur	Non-BCSU	Public	4330	43
	Christian Hospital Nowrangpur	Non-BCSU	NGO/Trust/ Charitable	2508	67
Nayagarh	Odisha Red Cross Blood Bank District Head Quarter Hospital	Non-BCSU	Public	5607	61
Nuapada	Odisha Red Cross	Non-	Public	3889	56

	Blood Bank, DHH, Nuapada	BCSU			
	Evangelical Hospital Blood Bank,Khariar ,Odisha	Non-BCSU	NGO/Trust/ Charitable	1154	63
Puri	Aharya Harihar Red Cross Blood Bank	Non-BCSU	NGO/Trust/ Charitable	5261	78
Rayagada	Red Cross Blood Bank, DHH,Rayagada	Non-BCSU	Public	3272	48
	Christian Hospital Blood Bank	Non-BCSU	NGO/Trust/ Charitable	2515	44
	Red Cross Blood Bank sub- Divisional Hospital Gunupur,Rayagadh	Non-BCSU	Public	868	27
Sambalpur	ORC Blood Bank, VSS Medical College and Hospital, Burla	BCSU	Public	18158	67
	Red Cross Blood Bank Sambalpur	Non-BCSU	Public	8228	61
	ORC Blood Bank ,Rairakhol, Sambalpur,	Non-BCSU	Public	900	38
	Odisha Red Cross Blood Bank , Kuchinda	Non-BCSU	NGO/Trust/ Charitable	838	30
Sambalpur	JMJ Blood Bank	Non-BCSU	NGO/Trust/ Charitable	262	51
	Odisha Red Cross Blood Bank,Subarnapur	Non-BCSU	Public	3663	58
	Red Cross Blood Bank, Orissa , R.G.H Rourkela	Non-BCSU	Public	13533	70
	Odisha Red Cross Blood Bank	Non-BCSU	Public	4556	48
	Immunohaematology & Blood Transfusion Centre	BCSU	Public	4505	52
	Hi-Tech Medical College & Hospital,Rourkela	Non-BCSU	NGO/Trust/ Charitable	1511	44
	O.R.C Blood Bank,Sundargarh	Non-BCSU	Public	1315	52

7.2 NACO/NBTC – Questionnaire for Blood Banks

NACO/NBTC - Questionnaire for Blood Banks								
Data Filled by								
Mobile Phone *Number* ***(Person filled the data)***								
Section A – GENERAL								
A1	**Basic Information**							
1	Name of the Blood Bank (as mentioned in the licence)							
2	Address 1 (Institution name)							
3	Address 2 (Door number & Street name – if applicable)							
4	Address 3 (Important land mark - if applicable)							
5	City/Town							
6	District							
7	State							
8	Pin code							
9	Blood Bank Phone number (Land line including area code)							
10	Blood bank Email ID							
11	Do you have internet facility?					Yes		
						No		
12	Name of the Blood Bank In-charge *(This should be the name of the current Medical Officer in charge)*							
13	Is the name of the Medical officer mentioned in the Licence, the current medical officer?					Yes		
						No		
14	Designation *(Please enter designation of the Medical Officer in the blood bank (e.g. Civil surgeon, or academic like Asst. Prof etc.)*							
15	Highest Qualification *(Tick only one)*					MBBS		
						MD		
						MS		
						Diploma		
16	Specify branch/Broad speciality							
17	Email ID: *(Official/Personal Email where the*							

	medical officer can be directly contacted). This is apart from the blood bank email ID provided above.		
18	Fax number		
19	Telephone number 1 – Medical Officer *(Mobile)*		
20	Telephone number 2 – Medical Officer *(Landline including STD code)*		
21	Type of blood bank as per NACO category	Model blood Bank	
		Blood Component Separation Units	
		Major Blood Bank	
		District level blood bank	
		Others	
22	Who is the blood bank owned by?	Public (Central/State/Local government)	
		Public (Other than ministry of health e.g. PSU, Army etc.)	
		NGO/Trust/Charitable – NACO Supported	
		NGO/Trust/Charitable	
		Private - Others	
23	Is the Blood Bank attached to any of the following?	Hospital	
		Lab	
		Stand alone	
24	If attached to Private Hospital, specify level of hospital	Medical College Hospital	
		Tertiary care hospital (other than medical college)	
		Secondary care hospital	
25	If attached to public/govt. hospital, specify the level of the hospital	Sub-District hospital	
		District level hospital	
		Medical College hospital	
		Tertiary care hospital (other than Medical College)	
26	If the blood bank is attached to a hospital, please specify the number of inpatient beds available		
27	Are you permitted to conduct Blood donation camp?	Yes	
		No	
28	How many Blood storage centres are linked to your blood bank?		
29	BB working hours *(Specify hours per day*)		

A2	**License Information**	
1.	**BB License Number** *(Enter your license number. This should be exactly as is displayed in your license issued by the Drugs Controller Office and will be used for verification purposes. This is a mandatory field and should be entered regardless of the status of license - under-*	

	renewal etc. (**You will have to submit a self-attested photocopy of the currently displayed license along with this form**.)		
2	Status of Current License	Valid	
		Under renewal	
3	Date of issue of current licence DD/MM/YYYY		
4	Last Inspection by licensing authority	< 1 year	
		1-2 years	
		2-3 years	
		3-4 years	
		>4 years	
A3	**Basic Statistics (Date of reporting from Jan-2015- Dec-2015)**		
1	Number of voluntary donations		
2	Number of replacement donations		
3	Number of autologous deposits		
4	Total Annual collection for reporting period (Jan - Dec 2015) Total Annual collections (sum of A3.1+A3.2+A3.3)		
5. Transfusion Transmissible Infections - Annual statistics		**Number tested**	**Number positive**
	HIV(Anti-HIV I & II)		
	HCV (Anti-HCV)		
	HBV (HBs Ag)		
	Syphilis (RPR/TPHA/ELISA)		
	Positive for Malaria (Any method)		
A4.	**Reporting Summary**		
1	Are you in compliance with NBTC guidelines?	Yes	
		No	
2	Are you recovering processing charges for blood/components within NBTC/SBTC norms?	Yes	
		No	
3	Are you displaying stock position in the blood bank premises?	Yes	
		No	
4	Are you submitting statistics to the State Drugs controller?	Regular	
		Occasional	
		No	
5	Are you reporting in SIMS (strategic Information Management System- NACO)?	Regular	
		Occasional	
		No	
6	If yes to Q5, please provide your SIMS ID		

7	If you are not reporting to SIMS, would you be willing to report in the future?	Yes	
		No	
8	Are you reporting in the E-blood banking?	Regular	
		Occasional	
		No	
9	If Regular/ Occasional to 8, specify *(more than one can be selected)*	State	
		National (NHP)	
		Other(Specify	
10	Please provide E Blood banking user ID *(State)*		
11	Please provide E Blood banking user ID *(National)*		
12	If not part of e-blood banking, would you be willing to participate in future?	Yes	
		No	

SECTION B			
B1	**Blood Donor(Reporting from Jan 2015- Dec 2015)**		
Definition of VBD = Close relatives should NOT be counted as VBD			
1	Are you recruiting voluntary blood donors?	Yes	
		No	
2	Is donor selection performed as per regulatory norms?	Yes	
		No	
3	Do you maintain records of donor deferral?	Yes	
		No	
4	Is pre-donation counselling being performed for blood donors?	Regular	
		Occasional	
		No	
5	Is post donation counselling being performed for blood donors?	Regular	
		Occasional	
		No	
6	Are you conducting Blood donor drives/Blood collection camps?	Regular	
		Occasional	
		No	
7	If you conduct camps, how many have been conducted in the reporting period? *(Provide numbers of VBD camps conducted during the period January - December 2015.)*		
8	Does the blood bank have dedicated staff for the promotion of Voluntary blood donors? *(If your blood bank has dedicated staff for camps, answer yes.)*	Yes	
		No	
8 a.	if Yes to 8, select as applicable *(More than one may be selected)*	Donor Motivator	
		Public relations officer (PRO)	
		Social Worker	
9	Is there a specific budget for donor program?	Yes	
		No	
10	If Yes, Specify budget source	Central	

		State	
		Others (Specify)	
11	Is there a donor database in the blood bank *(Donor database is essential to contact donors to remind them or to call during an emergency?)*	Yes	
		No	
12	If yes to Q 11, is it in electronic format or paper based?	Electronic	
		Paper	
		Both	
13	What percentage of the voluntary blood donors are repeat blood donors? (%)		
14	Does your blood bank have a mobile blood collection facility? *(Answer yes if your Blood bank has a mobile facility (bus or van with donor couches)*	Yes	
		No	
15	Source of funds for the mobile blood collection *(Indicate the source of funding for the purchase of the mobile blood donor van.)*	State	
		Central	
		Donor	
		Others	
16	Specify, other source of funds		
17	Is there a record for donor adverse reactions?	Yes	
		No	
18	Is there a referral system for HIV sero-reactive blood donors?	Yes	
		No	
19	If yes to Q 18, please specify what is the process adopted.		

Section C
Technical – Immunohematology

		Blood Group (Tick as applicable)		**Rh Type** (Tick as applicable**)**
C1.	Which of the following tests are performed for determination of ABO and Rh (D) groups and what techniques are followed?	Forward	Reverse	
C1.1.	Slide			
C1.2	Tube			
C1.3	Micro plate			
C1.4	Column agglutination Gel/Microparticle)			
C1.5	Solid phase			
C1.6	Other Specify			

1	How do you perform RhD typing?	Monoclonal reagent	
		Polyclonal reagent	
		Both	

2	Do you perform irregular antibodies screening on blood donations and patient sample?		Yes	
			No	
3	Do you perform direct antiglobulin test (DAT/DCT)? *(If you are performing Direct Antiglobulin test (DAT) - earlier called as Direct Coombs Test (DCT), answer yes.)*		Yes	
			No	
4	If yes to previous question, please specify method	Tube		
		Column agglutination		
		Solid phase		
5	Do you perform indirect antiglobulin test (IAT/ICT)?		Yes	
			No	
6	If yes, to previous question please specify method	Tube		
		Column agglutination		
		Solid phase		
7	Number of group and type tests performed in reporting period (Jan - Dec 2015*) (Specify the number of group and type tests performed - Total of all patient and donor tests in the reporting period - January to December 2015.)*			
8	Number of compatibility testing performed in reporting period. *(Specify number of compatibility tests performed in the reporting period January to December 2015)*			
9	Total Number of DAT/DCT tests performed in the reporting period *(Specify number of DAT/DCT tests performed in the reporting period (January to December 2015)*			
10	Total Number of IAT/ICT tests performed in the reporting period *(Specify number of DAT/DCT tests performed in the reporting period (January to December 2015)*			
11	Total Number of antibody screening performed in reporting period *(If you answered YES to Q2, Specify number of antibody screening tests performed in the reporting period (January to December 2015).*			
12	Do you have automation for Immunohematology testing? *(If you have implemented any kind of automation, please indicate so.)*		Yes	
			No	
13	Do you perform Internal QC for all immunohematology tests (blood group/DAT/IAT etc.)? *(Please answer yes if you are performing internal quality control (IQC) for the immunohematology tests listed above. They include daily QC on reagents and cells.)*		Yes	
			No	
14	Do you participate in an external quality assessment program or scheme (EQAS) for Immunohematology tests usually performed in your laboratory?		Yes	
			No	
15	If yes to 14, Specify name of program/provider			
16	If yes to 14, EQAS Membership ID number/ PIN#.			
17	If yes 14, specify Highest level of EQAS program participant in		Inter-lab	
			National	
			International	

18	If you are not participating in EQAS for immunohematology, will you be willing to do so in the future?	Yes	
		No	
19	If Yes to above question, will your blood bank be able to allocate financial resources (about Rs.2500 per year)?	Yes	
		No	
20	If your answer to Q 19 is NO, when do you think you will be ready for EQAS participation? (immunohematology)	Next 6 months	
		Later than 6 month	
21	Are you a member of National Haemovigilance Program of India (HVPI)?	Yes	
		No	
22	If yes, provide HVPI ID Number		
23	If not, would you be willing to participate in HVPI in the near future?	Yes	
		No	
24	Are you reporting all adverse events to the National Haemovigilance Program of India?	Yes	
		No	
25	Number of adverse reactions recorded in the reporting period		
26	Does your hospital have regular transfusion committee meetings?	Yes	
		No	
27	What is the frequency of Transfusion committee meetings?	Annual	
		Half-yearly	
		Quarterly	
		Occasional	

Section D
Technical - Screening For Transfusion Transmissible Infections (TTI)

Does the blood bank screen the following TTIs?

	Type of Test	Platform (please tick appropriate)		Method (please tick appropriate)
1	**HIV I & II**	Rapid		
		ELISA		Manual ☐ Automated ☐
		CHEMI		Manual ☐ Automated ☐
		NAT		Manual ☐ Automated ☐
1.1	Specify % of donors tested by Rapid Test?			
2	**Hepatitis B**	Rapid		
		ELISA		Manual ☐ Automated ☐
		EM		Manual ☐ Automated ☐
		NAT		Manual ☐ Automated ☐
2.1	Specify % of donors tested by Rapid Test?			
3	**Hepatitis C**	Rapid		

		ELISA		Manual ☐ Automated ☐	
		CHEM		Manual ☐ Automated ☐	
		NAT		Manual ☐ Automated ☐	
3.1	Specify % of donors tested by Rapid Test?				
4	**Syphilis**	RPR		Manual ☐ Automated ☐	
		TPHA		Manual ☐ Automated ☐	
		ELISA		Manual ☐ Automated ☐	
5	**Malaria**	Rapid			
		Fluorescent		Manual ☐ Automated ☐	
		Slide microscopy			
		ELISA		Manual ☐ Automated ☐	
6	Does the blood bank have an algorithm for units that test POSITIVE in initial screening? *(If you have a method of verifying a sample that has tested positive on the screening test please answer yes.)*			Yes ☐ No ☐	
7	If yes to Q6 , Repeat testing with same test/ technique			Yes ☐ No ☐	
8	If Yes to Q6, Repeat testing with different test/technique			Yes ☐ No ☐	
9	If yes to Q6, Recalling donor for repeat sample			Yes ☐ No ☐	
10	Do you perform independent internal QC (Third party controls) with TTI testing?			Yes ☐ No ☐	
11	Do you participate in an external quality assessment program or scheme (EQAS) for TTI *(Viral Markers, Malaria, and Syphilis) testing?*			Yes ☐ No ☐	
12	If yes, Specify program/provider				
13	Membership ID number (PIN)				
14	Level of EQAS			Inter-lab ☐ National ☐ International ☐	
15	If you are not participating in EQAS for TTI screening, will you be willing to participate in future?			Yes ☐ No ☐	

16	If Yes to Q15, will your blood bank be able to provide financial support (about Rs. 2500 per year)	Yes	
		No	
17	If your answer to Q 15 is NO, when do you think you will be ready for EQAS (TTI screening) participation?	Next 6 months	
		Later than 6 months	

Section E
Technical - Component Preparation (Applicable only to BCSU)

1	Does your blood bank prepare components?	Yes	
		No	

If your answer to Q1 is NO, SKIP TO SECTION F

If Yes, List the components and number prepared and issued in the period Jan to December 2015

2	Number of donated blood that was used for component preparation during the period Jan- December 2015.	

		Number prepared	No. issued (utilized)
3	Packed red cells IP (With or without Additive)		
4	Platelet concentrate IP		
5	Fresh frozen plasma (FFP)		
6	Cryoprecipitated antihaemophilic factor IP		
7	Human plasma IP		
8	Other (specify)		

9	Do you perform apheresis for components?	Yes	
		No	
	If yes to above question, Specify the following details		

		Number prepared	No. issued (utilized)
10	Platelet concentrate IP		
11	Fresh frozen plasma (FFP)		
12	Granulocytes concentrates		
13	Other (specify)		

14	Do you perform QC for the components prepared? *(If you perform quality control for all components, answer yes.)*	Yes	
		No	
15	If yes to above, Are the Factor assays on Fresh Frozen plasma/Cryoprecipitate performed at your Blood Bank?	Yes	
		No	
16	If yes for above question, do you participate in external quality assessment scheme (EQAS)?	Yes	
		No	
17	If yes, to above question, Specify agency		

SECTION F
Quality Management Systems

F 1	Are you aware of quality management systems for Blood bank	Yes	
		No	
1	Is the blood bank accredited?	Yes	
		No	
2	If yes, provide Name of Accrediting Body		

3	Do you have a document control system - other than mandatory registers as D&C act?	Yes	
		No	
4	Do you have Standard Operating Procedures (SOPs) for all technical processes?	Yes	
		No	
5	Do you have written responsibilities for all levels of staff?	Yes	
		No	

How many staff are currently employed in each of the following categories and how many of them have been trained during the reporting period Jan 2015 - Dec 2015? (Questions 6 - 15)

	Staff Details	Total number of staff	Number on contract	NACO/NBTC Supported in-service training	Other National Training
6	Professor				
7	Associate Professor				
8	Assistant Professor				
9	Senior Resident/Tutor				
10	Medical Officer *(include senior/Junior)*				
11	Technical Staff				
12	Nursing staff				
13	Counsellor				
14	PRO/Donor motivator				
15	Administrative staff				
16	Support staff				
	If other staff, please specify				

Total number of staff			
17	In your opinion, does the BB have adequate staff to function optimally (24x7)? This may be decided based on the volume and duration of work hours.	Yes	
		No	
18	Do you monitor Quality indicators or Key Performance indicators?	Yes	
		No	
19	If yes to above question, please specify names of indicators		
20	Do you have a designated and trained Quality manager?	Yes	
		No	
21	Do you have a designated and trained Technical Manager?	Yes	
		No	
22	If you do not have either a trained Quality manager or Technical Manager please state reasons?		
23	Please specify if you have a plan for recruitment in the future?		

F2. EQUIPMENT AND SUPPLIES				
1	Does the blood bank have adequate equipment to meet regulatory requirements? *(If your blood bank has adequate equipment in working condition to meet expected workload, please answer yes.)*		Yes	
			No	
2	How is equipment purchase funded?	Local bodies		
		Central or upper (state) level agencies		
		Donors		
		Others (specify)		
3	Does the blood bank have a program for regular equipment maintenance?		Yes	
			No	
4	Are all the equipment calibrated regularly as per regulatory requirement?		Yes	
			No	
5	How are consumables purchased?	Local bodies		
		Central or state level agencies		
		Donors		
		Others (specify)		
6	Do you evaluate kits at your facility prior to procurement*? (Are kits evaluated locally (at your blood bank) prior to purchase (e.g. Titre and avidity for blood group Anti Sera?))*		Yes	
			No	
7	Is quality control for kits, reagents and blood bags carried out at your blood bank? *(Is quality control for kits performed locally (at your blood bank) Prior to use (e.g. Titre and avidity for blood group Anti Sera?))*		Yes	
			No	
8	Did you have a regular supply of the following items? (Jan to Dec 2015)			
8.1	Blood Bags		Yes	
			No	
8.2	TTI Screening Kits		Yes	
			No	
8.3	Blood grouping / IH reagents		Yes	
			No	
9	Number of staff vaccinated for Hepatitis B?			

EQUIPMENT LIST (Below is a summary equipment list (a subset of D&C list). Please specify the number in inventory and number in working condition? If you are using shared resources of hospital, you can mention that as well

		Number in inventory	**Number in working condition**
10	Donor beds/couches		
11	Any instrument for Hb Estimation *(other than CuS04 method)*		
12	Blood collection monitor (Blood agitator)		
13	Quarantine Blood bank refrigerator to store untested units with temperature recorder		
14	Container for safe disposal of sharps		

15	Oxygen supply equipment		
16	Computer with accessories and software		
17	General lab centrifuge for samples		
18	Bench top centrifuge for serological testing		
19	Blood transportation box		
20	Emergency drugs box/Crash card		
21	Autoclave machine (shared resource should be specified)		
22	Water bath		
23	Blood bank refrigerator (storage of tested blood) with temperature recorder		
24	Automated pipettes		
25	Refrigerated centrifuge (BCSU)		
26	Blood container weighting device		
27	Serology rotator		

7.3 Scoring sheet

Individual Scoring Sheet - Blood Component Separation Units			
GENERAL	**GENERAL SUMMARY**	**WEIGHTAGE**	**TOTAL**
Licence	Under renewal	1	
	Valid	3	
Subtotal			**3**
Annual collection	Below 1000	0	
	1000 to 2000	0.5	
	2000 to 5000	1	
	5000 to 10000	1.5	
	Above 10,000	2	
Subtotal			**2**
VNRBD	BB by VNRBD (%)	0	
	<25%	0	
	25-49%	1	
	50 - 74%	3	
	75-90%	4	
	Above 90	5	
Repeat DON	Repeat donation >25%	2	
Counselling	Pre and post donation counselling - Regular	2	
Subtotal			**9**
TECH-IH	BB performing only slide grouping (forward typing)	0	
	BB using tube method for forward typing	2	
	BB performing reverse grouping (Serum group)	2	
	BB performing tube method for compatibility testing	3	
	BB performing IQC for IH	3	
	BB Participating in EQAS for IH	3	
	Direct antiglobulin test (DAT/DCT)- Direct Coombs Test (DCT)	2	
	Indirect antiglobulin test (IAT/ICT)	2	
	Automation for Immunohematology testing	1	
Subtotal			**18**
TECH - TTI	BB performing IQC for TTI	3	
	BB Participating in EQAS for TTI	3	
	BB with follow up program for HIV Sero-positive donors	3	
HIV Testing	Rapid	1	
	Elisa	2	
	Advanced	3	
Hep B	Rapid	1	
	Elisa	2	
	Advanced	3	
Hep C	Rapid	1	

	Elisa	2	
	Advanced	3	
Syphilis	RPR	1	
Malaria	Slide/Rapid	1	
Subtotal			**20**
COMP			
	Component separation < 25	0	
	Component separation < 25-50%	1	
	Component separation 51 to 80%	2	
	Component separation > 80%	3	
	BB that performs component QC	2	
Subtotal			**5**
QMS	BB MO with relevant PG Qualification	3	
	Staff Nurse with NACO/NBTC Training	3	
	Technician with NACO/NBTC training	3	
	BB with designated and trained QM	2	
	BB with designated and trained TM	2	
	BB with Document control system	4	
	BB with calibration of equipment	4	
	BB with AMC for equipment	4	
	Quality control for kits, reagents and blood bags carried out at blood bank with regular bags supply	2	
	Quarantine Blood bank refrigerator to store untested units with temperature recorder	3	
	Blood bank accredited	5	
Subtotal			**35**
GEN	BB reporting regularly on SIMS under National AIDS Control Programme	3	
	BB Participating in Haemovigilance Program of India	1	
	E blood banking participation NBTC/NHP	1	
	E blood banking participation – State level	1	
	More than 50% of the staff are vaccinated for Hep B	1	
	Compliance with NBTC norms	1	
Subtotal			**8**
SCORES	**TOTAL**		**100**

Individual Scoring Sheet - Without Blood Component Separation Units			
GENERAL	**GENERAL SUMMARY**	**WEIGHTAGE**	**TOTAL**
Licence	Under renewal	2	
	Valid	3	
Subtotal			**3**
Annual collection			
	500 - 1000	1	

	1001 to 2000	2	
	2001 to 3000	3	
	3001 - 5000	4	
	>5000	5	
Subtotal			**5**
VNRBD	BB by VNRBD (%)		
	25-49%	1	
	50 - 74%	3	
	75-90%	4	
	Above 90	5	
Repeat DON	Repeat donation >25%	2	
	pre donation counselling - regular	2	
Counselling	post donation counselling - regular	2	
Subtotal			**11**
TECH-IH	BB performing slide ONLY for forward grouping	1	
	BB performing TUBE for forward grouping	2	
	BB performing reverse grouping (Serum group)	2	
	Compatibility testing with tube	3	
	BB performing IQC for IH	3	
	BB Participating in EQAS for IH	3	
	Direct antiglobulin test (DAT/DCT)- Direct Coombs Test (DCT)	2	
	Indirect antiglobulin test (IAT/ICT)	2	
	Automation for Immunohematology testing	1	
Subtotal			**18**
TECH - TTI	BB performing IQC for TTI	3	
	BB Participating in EQAS for TTI	3	
	BB with follow up program for HIV Sero-positive donors	3	
HIV Testing	Rapid	1	
	ELISA	3	
Hep B	Rapid	1	
	ELISA	3	
Hep C	Rapid	1	
	ELISA	3	
Syphilis	RPR	1	
Malaria	Slide/Rapid	1	
Subtotal			**20**

COMP	*Not applicable*		
QMS	BB MO with relevant PG Qualification	3	
	Staff Nurse with NACO/NBTC Training	3	
	Lab technician with NACO/NBTC training	3	
	BB with designated TM/QM	2	
	BB with SOPs	2	
	BB with Document control system	2	
	BB with more than 75% equipment functional	2	
	BB with calibration of equipment	4	
	BB with AMC for equipment	4	
	Quality control for kits, reagents and blood bags carried out at blood bank with regular supply	2	
	Quarantine Blood bank refrigerator to store untested units with temperature recorder	3	
	Blood bank accredited by NABH	5	
Subtotal			**35**
GEN	BB reporting regularly on SIMS under National AIDS Control Programme	3	
	BB Participating in Haemovigilance Program of India	1	
	E blood banking participation NBTC/NHP	1	
	E blood banking participation – State level	1	
	Compliance with NBTC norms	1	
	More than 50% of the staff are vaccinated for Hep B	1	
Subtotal			**8**
SCORES	**TOTAL**		**100**