A Report on the

"Assessment of Blood Banks in Chhattisgarh, India"

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Ministry of Health and Family Welfare, Government of 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 Chhattisgarh

According to Central Drugs Standard Control Organization (CDSCO), there were 49 blood banks in Chhattisgarh in 2015. The assessment exercise identified 52 functional blood banks across the state.Of the 52 blood banks, 16 (30%) were supported by National AIDS Control Organization,Ministry of Health and Family Welfare, Government of India and the remaining 36 (69.2%) were Non-NACO blood banks.

Raipur district (17) had the highest number of blood banks, followed by Durg (6), Bilaspur (5), and Dantewada, Korba, Raigarh, and Surguja district each comprising of 3 blood banks each.

In terms of NACO supported blood banks, Bilaspur and Raipur district had two blood banks each. In Non NACO blood banks Raipur (15) had the highest number of blood banks followed by Durg (5) and Bilaspur with 3 blood banks.

For the assessment 16 districts of Chhattisgarh state had been included, around 80% (43) of all the blood banks (n=52) in the state were in 8 districts that are, Raipur (17), Durg (6), Bilaspur (5), Raigarh (4), Dantewada (3), Korba (3), Surguja (3) and Dhamtari (2).

Considering the number of blood banks per one million population, 10 districts recorded more than the State average of 2 blood banks per 1,000,000 (one million) population. Raipur (7.9) recorded the highest followed by Narayanpur (7.2), Dantewada (5.6), Surguja (3.6), Durg (3.5), Mungeli (2.8), Raigarh (2.7), Dhamtari (2.5), Korba (2.5), and Bilaspur (2.2). Out of 27 districts, 10 districts did not have any blood banks which are Balod, Baloda Bazar, Balrampur, Bematara, Bijapur, Gariyaband, Kondagaon, Sukma, and Surajpur.

For the assessment 42 blood banks (16 NACO supported – 38.1% and 26 Non-NACO-61.9%) which have submitted the assessment forms in complete were included in the analysis.

Description of blood banks

- Around 54% of the blood banks in the state had component separation facility.
- Around 43 percent of blood banks are owned by public sector followed by not-for-profit (14, 33.3%) and Private sector (10, 23.8%).
- The majority (15; 93.8%) of NACO supported blood banks were owned by public sector and only one (6.3%) were owned by Not for profit sector such as NGOs, charitable trusts, societies, foundations etc.
- The private sector and not-for-profit blood bank had a higher proportion (50%) of blood component separation facility than the public sector blood bank (1%).

- The majority of the blood banks (29; 69%) were attached to hospitals, and the remaining (13; 31%) were standalone blood banks out of which 93.8% (15) and only one of the NACO supported blood banks were attached to hospitals and was standalone respectively.
- In the state of Chhattisgarh, 50% (21) of the blood banks had valid license and remaining 50% of blood banks had applied for renewal. Out of the 50% of the blood banks with valid license, 57.7% (15) were Non NACO and 37.5% (6) were NACO supported blood banks.

Annual Collection and Voluntary Blood Donation

- During January 2015 to December 2015, the annual blood collection from all the blood banks that reported was 204,852 of which 44.1% 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 4,996 units. The average annual collection of NACO supported blood banks was found to be higher (5,782 units) than the Non-NACO blood banks (4,543 units).
- The blood banks with component separation units recorded a higher average collection of 5,993 units compared to blood banks without blood component separation units which was 3,723units.
- The NACO supported blood banks collected 42.3% (86,724 units) of the total collection, of which 55.7% (48,341) units were through voluntary blood donation. The Non-NACO blood banks collected 57.7% (118,128) units of which 35.6 % (42,015) units were through voluntary blood donation.

Transfusion Transmitted Infections

- The HIV seroreactivity was found to be 0.13%; Hepatitis-C was 0.17%, Hepatitis-B 0.68%, Syphilis 0.30% and Malaria 0.04%. However, there is a huge variation between districts.

Component Separation

- Around 42% 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 (47.1%) in Non-NACO blood banks compared to NACO supported blood banks (28.5%).

Quality Management Systems

- The majority of blood banks (85.7%) reported that they adhered to the NBTC guidelines.
- Availability of document control system was reported by 50% of the blood banks in the state. Around 56% of NACO supported blood banks and 46.2% of Non-NACO blood banks reported that they had a document control system.
- In terms of Standard Operating Procedures (SOPs) for technical processes, all the blood banks reported that they had SOPs.
- At the state level, Internal Quality Control (IQC) for Immunohematology was reported by 66.7% of the blood banks and IQC for TTIs was reported by 42.9% of the blood banks.
- Around 73.8% 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 similar for immunohematology and TTIs with 7.1%.
- The state of Chhattisgarh had no blood banks 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 38.1% and 47.6% of the blood banks respectively.
- Around 73% of the blood banks reported that they had a regular equipment maintenance programme and around 78.6% reported that they calibrate the equipment as per requirement.

Reporting and Documentation

- 81% of Blood Banks reported that they were recovering processing charges within NBTC/SBTC norms and 66.7% of blood banks reported that they were displaying stock position in their Blood bank Premises.
- In terms of reporting requirement, 64.3% of the blood banks submitted regular reports to state drug controller, whereas 50% regularly reported in national strategic information management systems (SIMS).

Human Resources

- Around 97% of blood banks reported to have medical officers, all the blood banks had technical staff and 90.5% of the blood banks had nursing staff. However, only 52.4% had counsellors and 28.6% reported to have PRO/Donor motivators.
- Around 21% of the blood banks reported that they had at least one technical staff trained by NACO/NBTC; 16.7% blood banks reported they had atleast one trained medical officer and only 9.5% reported having trained nursing staff. The state reported that didn't have any trained counsellors or PRO/donor motivators in the blood banks.
- Majority of blood banks (95.2%) reported that they had regular supply of blood bags, TTI kits and regular supply of blood grouping reagents.

The current status of blood banks based on the assessment

- The mean assessment score of blood banks in the state was 53.94 (SD: 10.17). The Non-NACO blood banks scored higher (56.85; SD: 8.15) than the NACO supported blood banks (49.22; SD: 11.56).
- At the state level, almost all the blood banks (41; 98%) scored between 35 to 70. Only one blood bank score less than or equal to 35 and there were no blood banks having score above 70.
- In the NACO supported blood banks 94% of the blood banks scored between 35 to 70 and only one blood bank scored less than or equal to 35. In terms of Non NACO blood banks, all the blood banks scored between 35 to 70.
- Among the 6 districts which scored above the state average of 53.9, Bastar (70) scored the highest followed by Raigarh (62.8), Dantewada (59.7), Korba (58.8), Mahasamund (58.0), and Raipur (55.1). More than half of the blood banks (55.8%) were located in these districts.
- The mean scores of NACO supported blood banks were higher than the Non-NACO blood banks in three districts which are Dantewada (63), Korba (65) and Raigarh (66). In terms of Non-NACO blood banks, four districts Bilaspur (62.8), Durg (58.3), Raipur (57.9) and Rajnandgaon (47.8) scored higher than the NACO supported blood banks.
- The mean score of blood banks with component facilities (54.93; SD: 10.26) was found to be slightly higher than the mean score of those without component facilities (52.74; SD: 10.21).
- The mean assessment score of private owned blood banks (60.10; SD: 6.56) was found to be higher than the NGO/Trust/Charitable (53.39; SD: 9.22) and public owned blood banks (50.94; SD: 11.39).
- The mean assessment score of blood banks that collected between 3001 to 5000 blood units (56.71; SD: 10.66) was found to be higher than those which collected upto 3000 units of blood (54.06; SD: 8.48) and above 5000 blood units (52.25; SD: 11.61).
- The mean score was found to be higher among the blood banks that were part of EQAS for immunohematology (64.00; SD: 8.32) as compared to those who were not enrolled (53.17; SD: 9.97). Similar situation was found among those blood banks that were part of EQAS for Transfusion-Transmitted Infections (64.00; SD: 8.32) as compared to those who were not enrolled (53.17; SD: 9.97).

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 Chhattisgarh

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 and 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=23) and 2. Blood banks without component separation facility (n=19). 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 49 blood banks in the state of Chhattisgarh in 2015 (CDSCO, 2015). However, the assessment exercise identified 52 functional blood banks across the state. Of the total functional blood banks, 42 blood banks (16 NACO supported – 38.1% and 26 Non-NACO-61.9%) which have submitted the assessment forms in complete were included in the analysis.

Table 3- District Wise Descriptions of Blood Banks

District	NACO supported	Non-NACO	Total
Balod	-	-	-
Baloda Bazar	-	-	-
Balrampur	-	-	-
Bastar	1	-	1
Bametara	-	-	-
Bijapur	-	-	-
Bilaspur	2	3	5
Dantewada	1	2	3
Dhamtari	1	1	2
Durg	1	5	6
Gariyaband	-	-	-
Janjgir Champa	-	1	1
Jashpur	-	1	1
Kabirdham	1	-	1
Kanker	1	-	1
Kondagaon	-	-	-
Korba	1	2	3
Koriya	1	-	1
Mahasamund	1	-	1
Mungeli	-	1	1
Narayanpur	-	1	1
Raigarh	1	2	3
Raipur	2	15	17
Rajnandgaon	1	-	1
Sukma	-	-	-
Surajpur	-	-	-
Surguja	1	2	3
Chhattisgarh	**16**	**36**	**52**

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. Raipur district had the highest

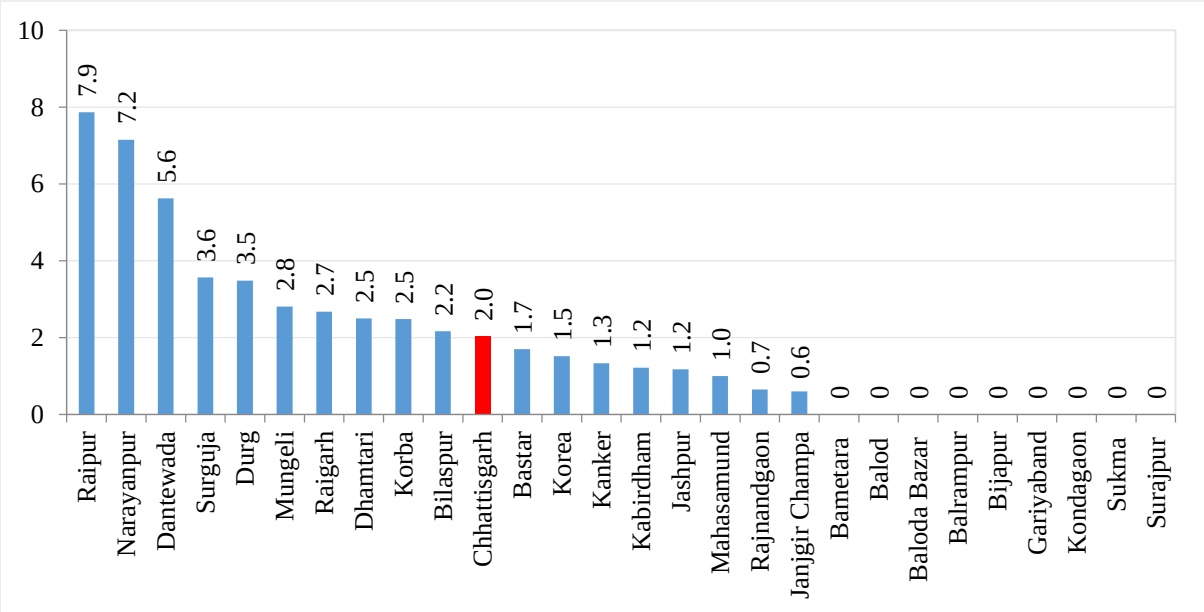
number of blood banks with 17 blood banks, followed by Durg (6), Bilaspur (5), Dantewada, Korba, Raigarh, and Surguja with each having 3 blood banks. There were 9 districts out of 27 districts which recorded no blood banks, namely Balod, Baloda Bazar, Balrampur, Bametara, Bijapur, Gariyaband, Kondagaon, Sukma and Surajpur.

In terms of NACO supported blood banks, Bilaspur and Raipur had 2 blood banks each and 12 districts which are Bastar, Dantewada, Dhamtari , Durg, Kabirdham, Kanker, Korba, Koriya, Mahasamund, Raigarh, Rajnandgaon, and Surguja each had one blood bank.

In Non NACO blood banks, Raipur had the highest number with 15 blood banks, followed by Durg (5) and Bilaspur (3). Districts such as Dantewada, Korba, Raigarh, and Surguja each had 2 blood banks and 5 districts which are Dhamtari, Janjgir Champa, Jashpur, Mungeli and Narayanpur had one blood banks each.

Considering the number of blood banks per one million population, 10 districts recorded more than the State average of 2 blood banks per 1,000,000 (one million) population. Raipur (7.9) recorded the highest followed by Narayanpur (7.2), Dantewada (5.6), Surguja (3.6), Durg (3.5), Mungeli (2.8), Raigarh (2.7), Dhamtari (2.5), Korba (2.5) and Bilaspur (2.2). Out of 27 districts, 9 districts did not have any blood banks which are Balod, Baloda Bazar, Balrampur, Bematara, Bijapur, Gariyaband, Kondagaon, Sukma, and Surajpur.

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



4.1 Basic details of blood banks (n=42)

As indicated earlier, 42 blood banks (16 NACO supported and 26 Non-NACO) that submitted the assessment forms were included in the analysis.

4.1.1 Category of Blood Banks: Out of 16 NACO supported blood banks 25% (4) of the blood banks had component separation facility. Out of 26 Non-NACO blood banks 73.1% (19) had component separation facility.

Table 4- Basic details of blood banks

Specifics	Description	NACO Supported	Non-NACO	Total
Type of BB	With components	4 (25.0%)	19(73.1%)	23 (54.8%)
	Without components	12 (75.0%)	7(26.9%)	19 (45.2%)
Ownership	NGO/Trust/Charitable	1 (6.3%)	13 (50.0%)	14 (33.3%)
	Private	0(0.0%)	10(38.5%)	10(23.8%)
	Public	15 (93.8%)	3(11.5%)	18 (42.9%)
Licence	Valid	6 (37.5%)	15 (57.7%)	21(50.0%)
	Under Renewal	10 (62.5%)	11 (42.3%)	21 (50.0%)
Attachment	Attached to Hospital	15 (93.8%)	14 (53.8%)	29 (69.0%)
	Attached to lab	-	-	-
	Stand alone	1 (6.3%)	12 (46.2%)	13 (31.0%)

At the District level, only six districts had component separation facility. Raipur (12) having the highest number of blood banks followed by Bilaspur and Durg, each having 4 blood banks with component separation facility. Other 3 districts which are Korba, Raigarh and Surguja had one BCSUs.

4.1.2 *Ownership:* As depicted in Table:- 4, around 43% of blood banks are owned by public sector followed by not-for-profit (14, 33.3%) and Private sector (10, 23.8%). The majority (15; 93.8%) of NACO supported blood banks were owned by public sector and only one (6.3%) were owned by not-for-profit sector such as NGOs, charitable trusts, societies, foundations etc. Among the NACO supported blood banks, only the 3 public sector blood banks and 1 not-for-profit blood bank had component separation facilities and with regard to Non NACO blood banks, there were 10 private and 9 not for profit blood banks with component separation facility.

As portrayed in Table-5, around 39% of all the public owned blood banks (n=18) were in three districts that are, Dantewada (3), Bilaspur (2), and Korba (2). In terms of not-for-profit around (n=14), 79% of the blood banks were clustered in four districts such as, Raipur (5), Bilaspur (2), Raigarh (2), and Surguja (2)

There were only three districts which had private sector blood banks (n=10) where Raipur (6) had the majority number of blood banks followed by Durg (3) and Bilaspur having only one blood bank.

Table 5-District wise list of blood banks by Ownership

District	Public	%	Not-for-profit	%	Private	%	Total
Bastar	1	100	-	-	-	-	1
Bilaspur	2	40	2	40	1	20	5
Dantewada	3	100	-	-	-	-	3
Dhamtari	1	100	-	-	-	-	1
Durg	1	25	-	-	3	75	4
Kabirdham	1	100	-	-	-	-	1
Kanker	1	100	-	-	-	-	1
Korba	2	66.7	1	33.3	-	-	3
Koriya	1	100	-	-	-	-	1
Mahasamund	1	100	-	-	-	-	1
Mungeli	-	-	1	100	-	-	1
Narayanpur	-	-	1	100	-	-	1
Raigarh	1	33.3	2	66.7	-	-	3
Raipur	1	8.3	5	41.7	6	50	12
Rajnandgaon	1	100	-	-	-	-	1
Surguja	1	33.3	2	66.7	-	-	3
Chhattisgarh	**18**	**42.9**	**14**	**33.3**	**10**	**23.8**	**42**

4.1.3 ***Organizational Attachment:*** The majority of the blood banks (29; 69%) were attached to hospitals, and the remaining (13; 31%) were standalone blood banks.

Majority of the NACO supported blood banks (15; 93.8%) were attached to hospitals and only one was a standalone. With regard to Non NACO 53.8% (14) blood banks were attached to hospitals and remaining 46.2% (12) were stand alone.

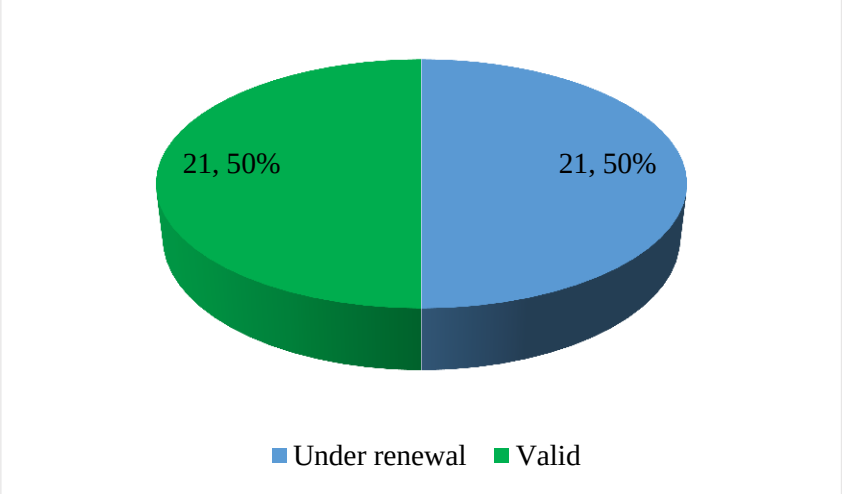
Further analysis indicated that all blood banks in the public sector, 60% (6) of the blood banks in the private sector, and 35.7% (5) of the blood banks in the not for profit sector were attached to hospitals. In terms of standalone, there were 64.3% (9) not-for-profit sector blood banks and 40% (4) private sector blood banks.

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.

In the state of Chhattisgarh, 50% (21) of the blood banks had valid license and remaining 50% of blood banks had applied for renewal. Out of the 50% of the blood banks with valid license, 57.7% (15) were Non NACO and 37.5% (6) were NACO supported blood banks. And the remaining 50% of blood banks which had applied for renewal, 62.5% (10) were NACO supported and 42.3% (11) were Non NACO blood banks

Similarly, 80% (8) of the private sector, 50% (7) of the not-for-profit sector and 33.3% (6) of the public sector had a valid and active license.

Figure 2- License Status (n=42)



The majority of the blood banks (n=21) which have reported as "deemed renewal" had their last inspection by licencing authority during the last one year (11; 52.4%); 38.1% (8) had their inspection between the last 1 to 2 years, and 1 blood bank each had their inspection in 3 to 4 years and more than 4 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 that the state with a population of 25,545,198, currently needs around 255,452 units of blood. As per this criteria, Chhattisgarh is producing around 80% units of blood of 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 204,852 of which 44.1% units were through voluntary blood donations and the remaining were from replacement donations.

Figure 3-Annual Collections and Voluntary Donation

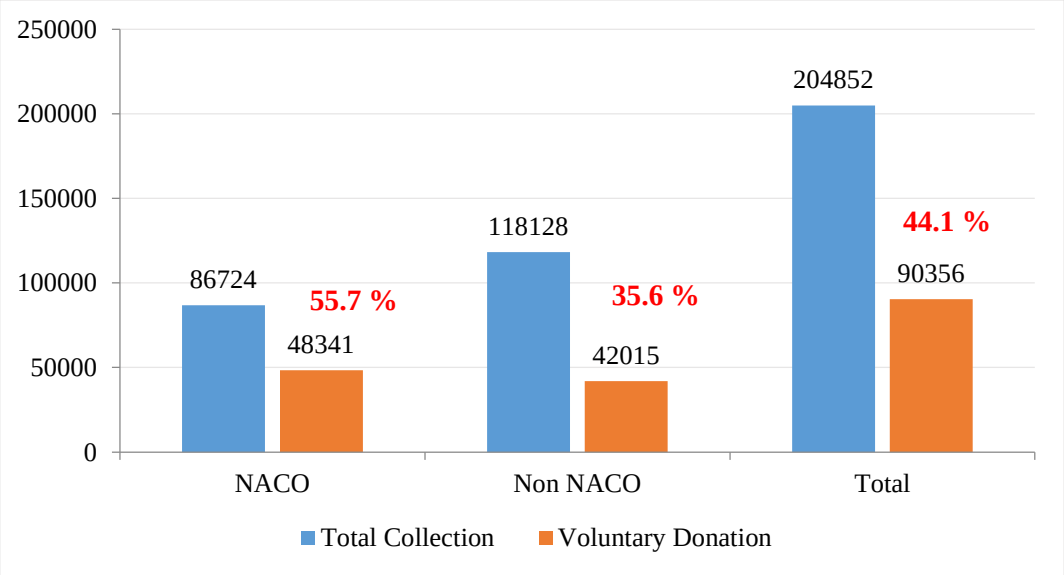
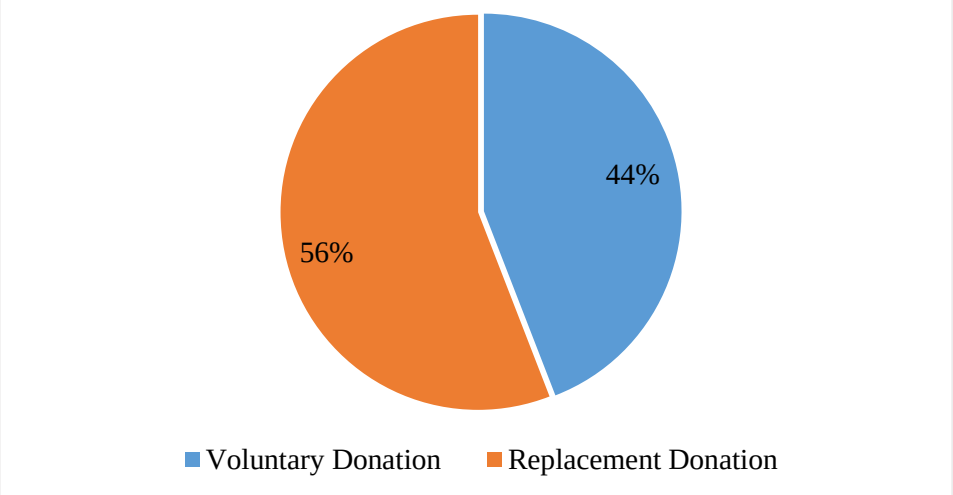


Figure 4- Type of Blood Donation (Voluntary vs Replacement Donation %)



The average annual collection of blood units of all the blood banks in the state was 4,996 units. The average annual collection of NACO supported blood banks was found to be higher (5,782 units) than the Non-NACO blood banks (4,543 units).

Table 6- Average Annual collection

District	NACO supported	Non-NACO	All BBs
Bastar	8084	-	8084
Bilaspur	5035	7686	6625
Dantewada	-	967	967
Dhamtari	1254	-	1254
Durg	7887	4337	5224
Kabirdham	840	-	840
Kanker	3447	-	3447
Korba	3336	4475	4095
Koriya	3377	-	3377
Mahasamund	398	-	398
Mungeli	-	1240	1240
Narayanpur	-	115	115
Raigarh	8594	2868	4777
Raipur	10102	5032	5877
Rajnandgaon	11276	-	11276
Surguja	7958	6884	7242
Chhattisgarh	**5782**	**4543**	**4996**

Similarly, the blood banks with component separation units recorded a higher average collection of 5,993 units compared to blood banks without blood component separation units which was 3,723units. However, the variation in the collection was found to be very high across and within districts.

The NACO supported blood banks collected 42.3% (86,724 units) of the total collection, of which 55.7% (48,341) units were through voluntary blood donation. The Non-NACO blood banks collected 57.7% (118,128) units of which 35.6% (42,015) units were through voluntary blood donation. Although NACO annual collection was less than annual collection of Non-NACO blood banks, their proportion of voluntary collection was higher.

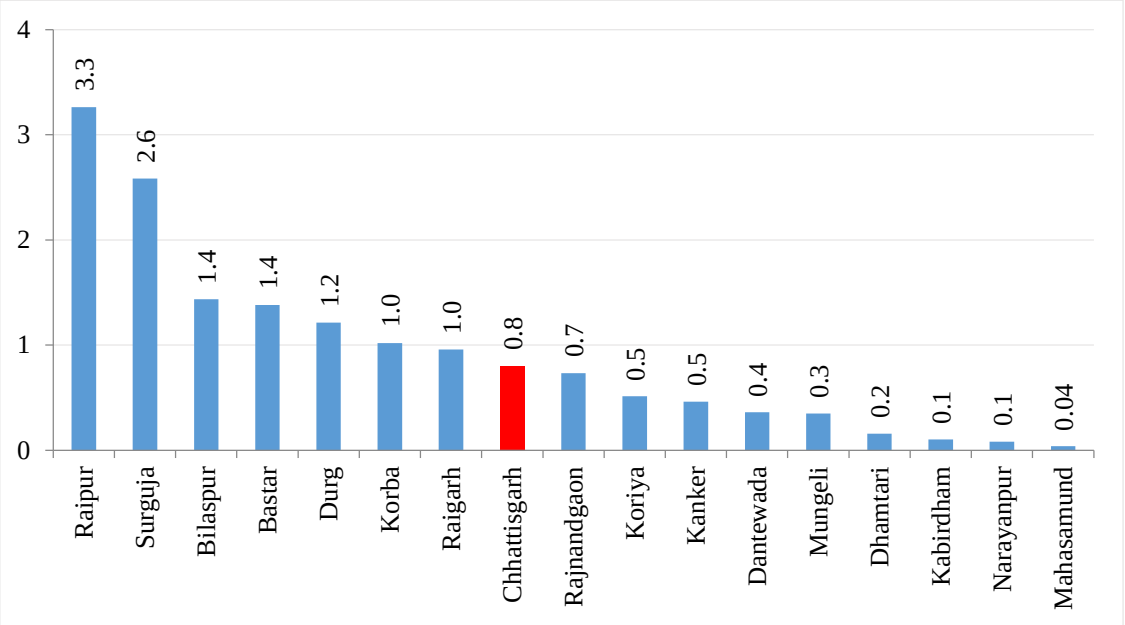
Blood banks with component separation facility collected 67.3% of blood units (137,831) and the remaining 32.7% (67,021) were collected by blood banks without the component facility. Similarly, blood banks owned by public sector collected 40.1% (82,156) of the total collection followed by the not-for-profit sector 36.6% (74,977) and private sector blood banks (23.3%, 47,719).

Table-7 indicates the district-wise details of the total annual collection, voluntary and replacement donation in the state of Chhattisgarh. Blood banks reported a varying proportion of VNRBD ranging from 5.2% to 100%.

Table 7- Annual blood collection and percentage of VBD

Districts	Total Voluntary Donation	Replacement Donation	Annual Collection	VBD%
Bastar	8084	-	8084	100
Bilaspur	6880	26247	33127	20.8
Dantewada	1675	258	1933	86.7
Dhamtari	1254	-	1254	100
Durg	8034	12863	20897	38.4
Kabirdham	840	-	840	100
Kanker	253	3194	3447	7.3
Korba	643	11642	12285	5.2
Koriya	3377	-	3377	100
Mahasamund	398	-	398	100
Mungeli	836	404	1240	67.4
Narayanpur	115	-	115	100
Raigarh	3639	10691	14330	25.4
Raipur	31521	39002	70523	44.7
Rajnandgaon	11276	-	11276	100
Surguja	11531	10195	21726	53.1
Chhattisgarh	**90356**	**114496**	**204852**	**44.1**

Figure 5- Annual Collection per 100 population- District wise

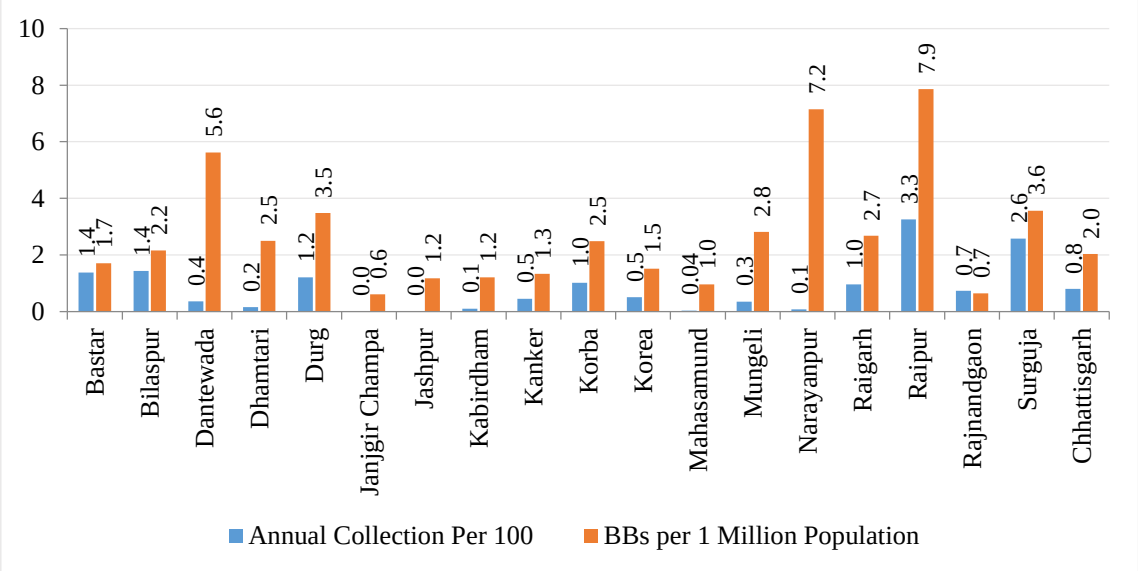


The annual collection of blood units per 100 individuals was found to be 0.8% in the state, which is slightly below the WHO suggested requirement that 1% of the population can meet

a nation's (populations) most basic requirements for blood. However, there is a huge disparity in the collection of blood between districts.
Seven districts which are Raipur (3.3), Surguja (2.6), Bilaspur (1.4), Bastar (1.4), Durg (1.2), Korba (1.0), and Raigarh (1.0) collected more than the state average of 0.8 units per 100 population. The remaining 9 districts fall below the state average with Kabirdham (0.1), Narayanpur (0.1) and Mahasamund (0.04) having the least recorded. (Refer Fig-5). It was reported that districts such as Bijapur, Balod, Baloda Bazar, Balrampur, Bametara, Gariyaband, Kondagaon Sukma and Surajpur did not have any blood banks. However, two districts which are Janjgir Champa and Jashpur had one blood bank each which did not participate in the assessment.

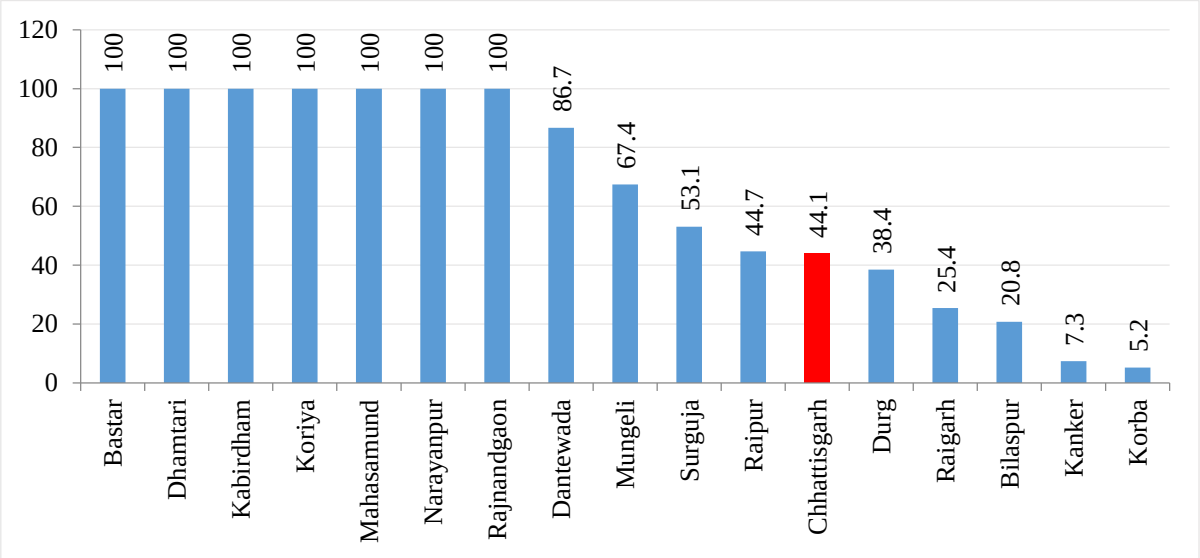
Figure 6 illustrates the district wise comparative information of annual collection per 100 population and number of blood banks per one million populations. This indicates that the state had 2 blood banks per million population that collected 0.8 units per 100 population at the ratio of 2 BB: 0.8 blood unit. The ratio was wide in districts such as Raipur, Mahasamund, Bilaspur, Dhamtari and Mungeli where the collection of blood was relatively less while having more number of blood banks proportionate to population. Districts such as Bastar, Kabirdham and Rajnandgaon had more or less proportional or balanced collection of blood to the number of blood banks.

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



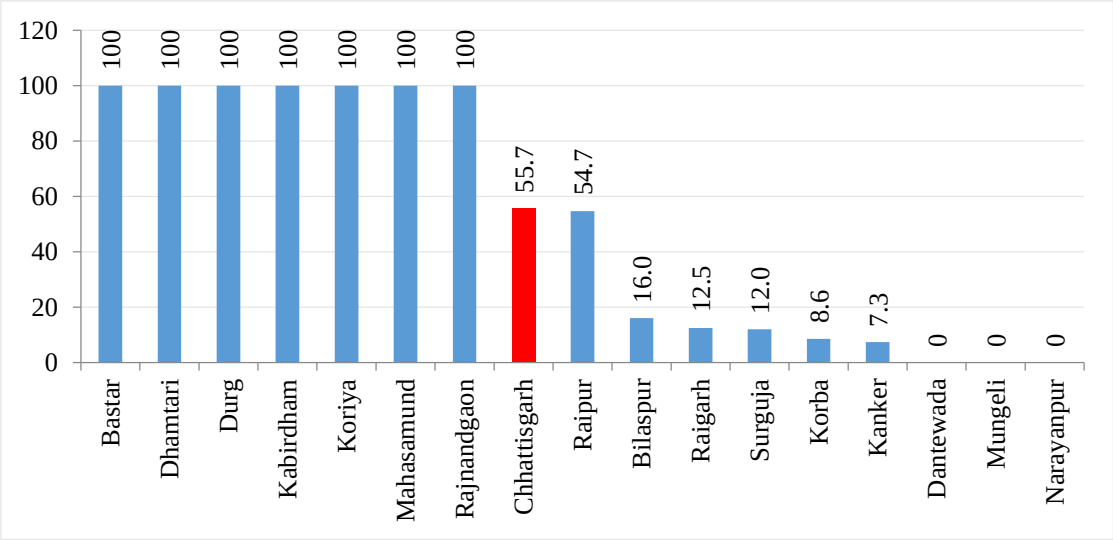
4.2.2 ***Voluntary blood donation:*** As depicted in Figure-7, majority of the districts have recorded more than the state average of 44.1%. Out of the 11 district which has scored above the state average, 7 districts which are Bastar, Dhamtari, Kabirdham, Koriya, Mahasamund, Narayanpur, and Rajnandgaon have reported 100% voluntary blood donation. Only 5 districts have recorded less than the state average with Korba district scoring the least with 5.2% of voluntary donation.

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



Among NACO supported blood banks, 7 districts which are Bastar, Dhamtari, Durg, Kabirdham, Koriya, Mahasamund, and Rajnandgaon recorded 100% voluntary donation. The remaining 6 districts, which are Raipur, Bilaspur, Raigarh, Surguja, Korba, and Kanker scored lower than the state average of 55.7% of voluntary donation during January to December 2015. There were 3 districts namely Dantewada, Mungeli and Narayanpur, where Dantewada district had 1 NACO supported blood bank which didn't report any voluntary collection while Mungeli and Narayanpur district had no NACO supported blood banks

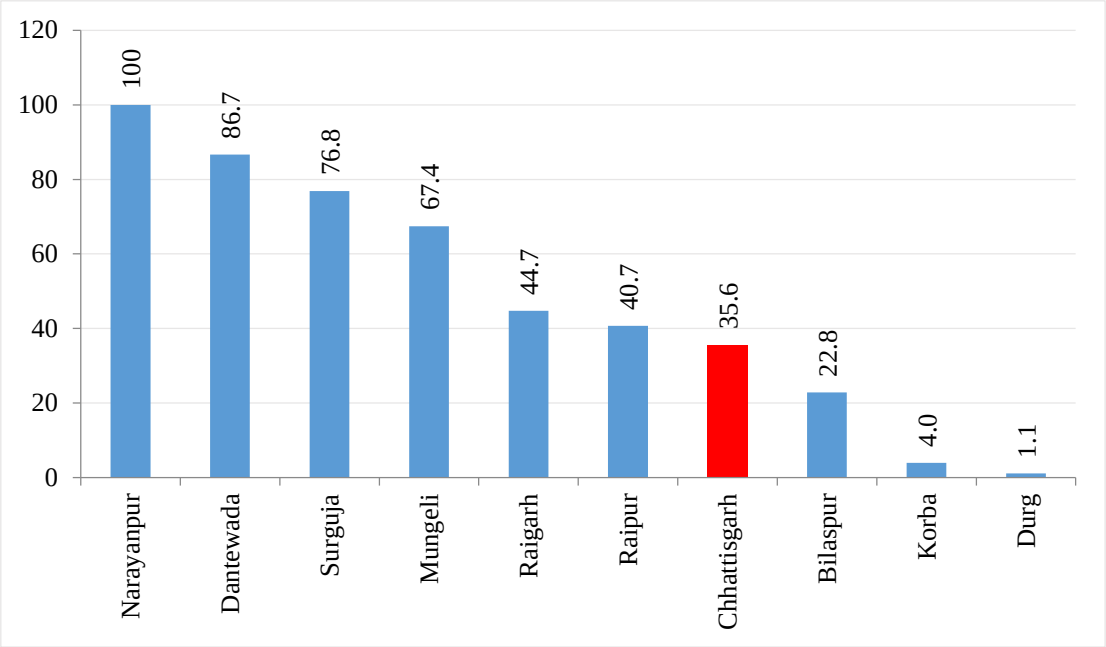
Figure 8- Percentage of Voluntary Blood Donation by District (NACO Supported)



Among Non-NACO blood banks, six districts recorded more than state average of 35.6%. Three districts recorded less than 35.6%. Durg district recorded the lowest VBD percentage (1.1%) in the state among Non-NACO blood banks. There were seven districts which are

Bastar, Dhamtari, Kabirdham, Kanker, Koriya, Mahasamund, and Rajnandgaon which did not have any voluntary blood donation by Non NACO blood banks.

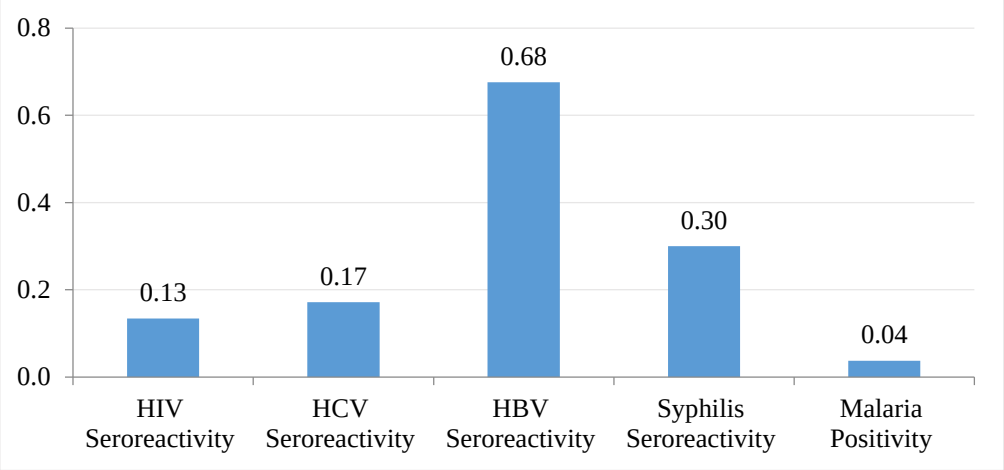
Figure 9- Percentage of Voluntary Blood Donation by District (Non-NACO)



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. HIV reactivity was found to be 0.13%; Hepatitis-C was 0.17%, Hepatitis-B 0.68%, Syphilis 0.30% and Malaria 0.04%. However, there is a huge variation between districts.

HIV, HBV reactivity rates and Malaria positivity rates were recorded higher in NACO supported blood banks. In terms of Non NACO blood banks HCV, and Syphilis and reactivity rates was found to be higher than NACO supported blood banks.

Table 8-Transfusion Transmitted Infections (%)

Category of BB	Transfusion Transmitted Infections %				
	HIV	HCV	HBV	Syphilis	Malaria
NACO Supported	0.14	0.15	0.70	0.21	0.08
Non-NACO	0.13	0.19	0.66	0.37	0.01
Overall	**0.13**	**0.17**	**0.68**	**0.30**	**0.04**

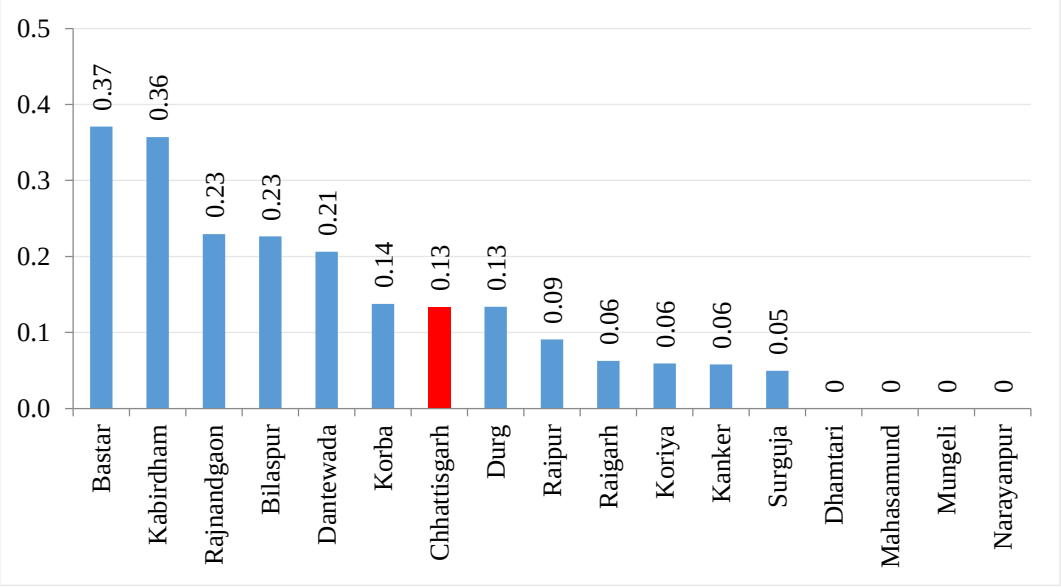
4.3.1 Transfusion Transmitted Infections by Category of blood banks: HIV, HBV, and Syphilis seroreactivity rates were found to be higher in blood banks with component facility as compared to blood banks without component separation facility.HCV seroreactivity and

malaria positivity was found to be higher in Blood banks without component separation facility

Table 9- Transfusion Transmitted Infections by category of blood banks

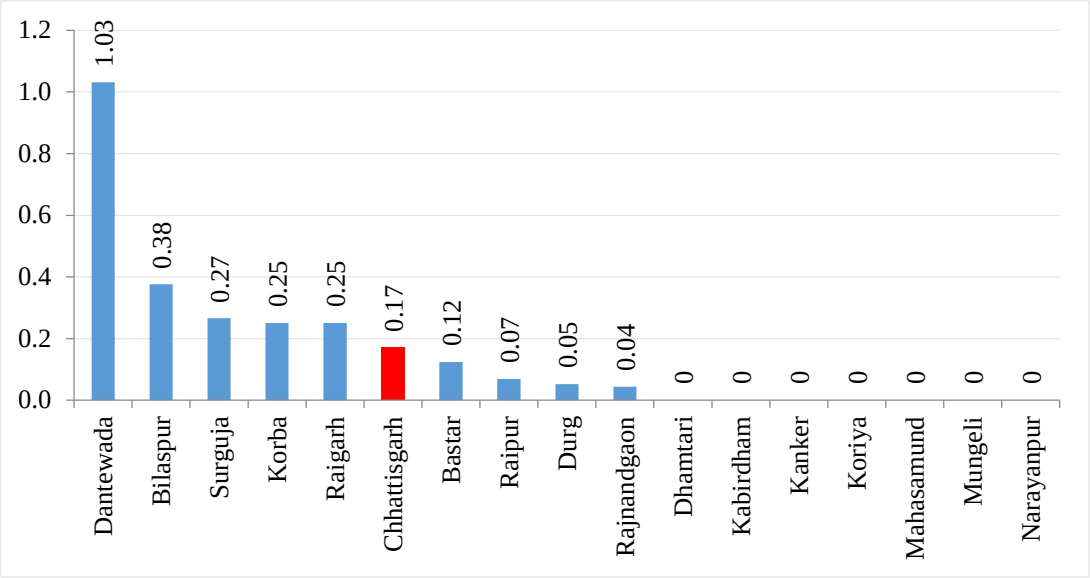
Category of BB	Transfusion Transmitted Infections %				
	HIV	HCV	HBV	Syphilis	Malaria
BBs with component facility	0.14	0.16	0.77	0.31	0.01
BBs without component facility	0.13	0.20	0.49	0.28	0.10
Overall	**0.13**	**0.17**	**0.68**	**0.30**	**0.04**

Figure 11- HIV Seroreactivity- By District (%)



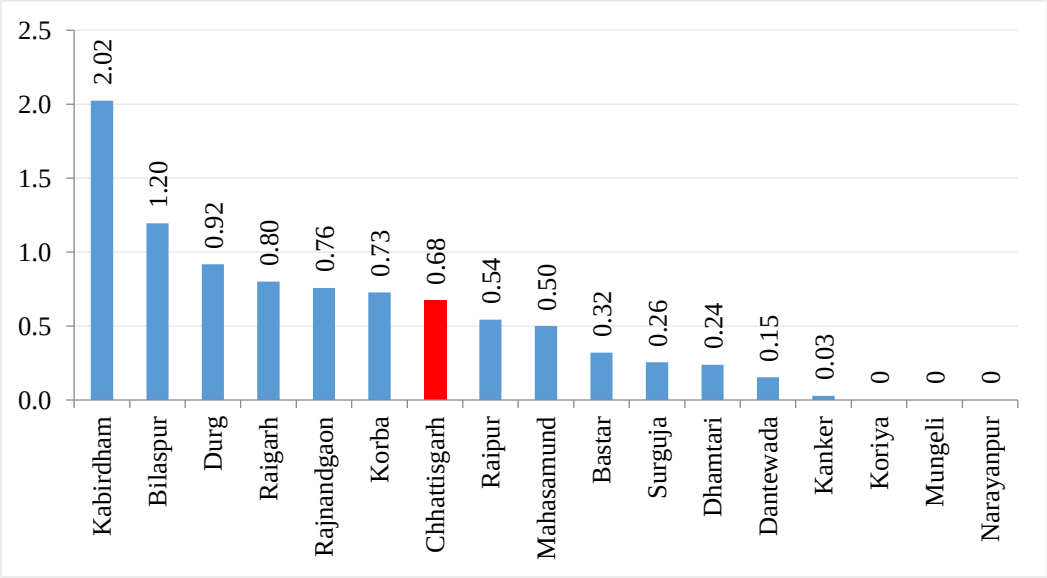
The majority of districts indicated lower HIV reactivity than the state HIV reactivity level of 0.13%. Bastar district recorded the highest seroreactivity of 0.37% followed by Kabirdham (0.36), Rajnandgaon (0.23), Bilaspur (0.23), Dantewada (0.21), and Korba (0.14). Four districts namely Dhamtari, Mahasamund, Mungeli and Narayanpur did not record any seroreactivity. Surguja district recorded the lowest with 0.05%.

Figure 12- HCV Seroreactivity- By District (%)



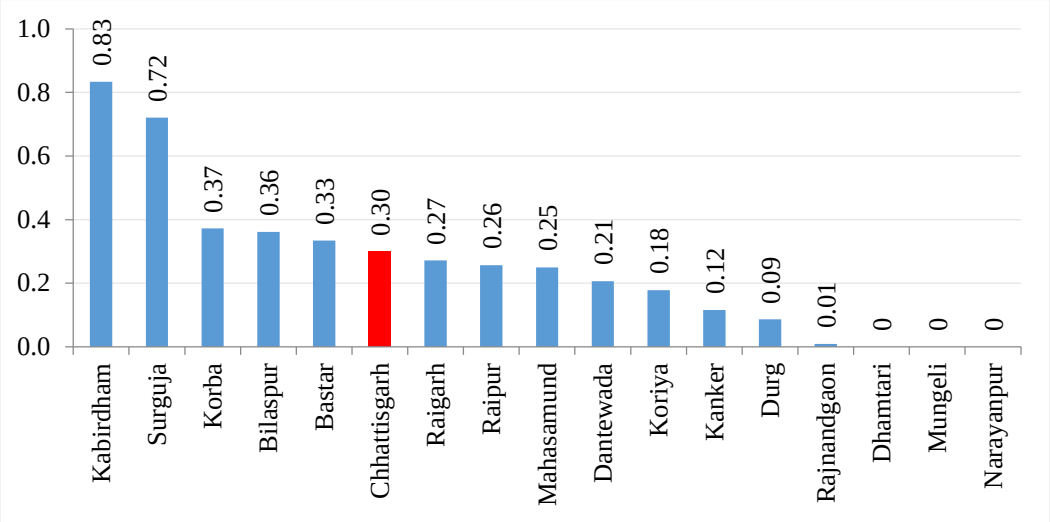
When considering Hepatitis C infection, districts like Dantewada (1.03), Bilaspur (0.38), Surguja (0.27), Korba (0.25) and Raigarh (0.25) recorded a higher reactivity compared to the state average of 0.17%. Rajnandgaon district recorded the lowest of 0.04% of reactivity.

Figure 13-HBV Seroreactivity- By District (%)



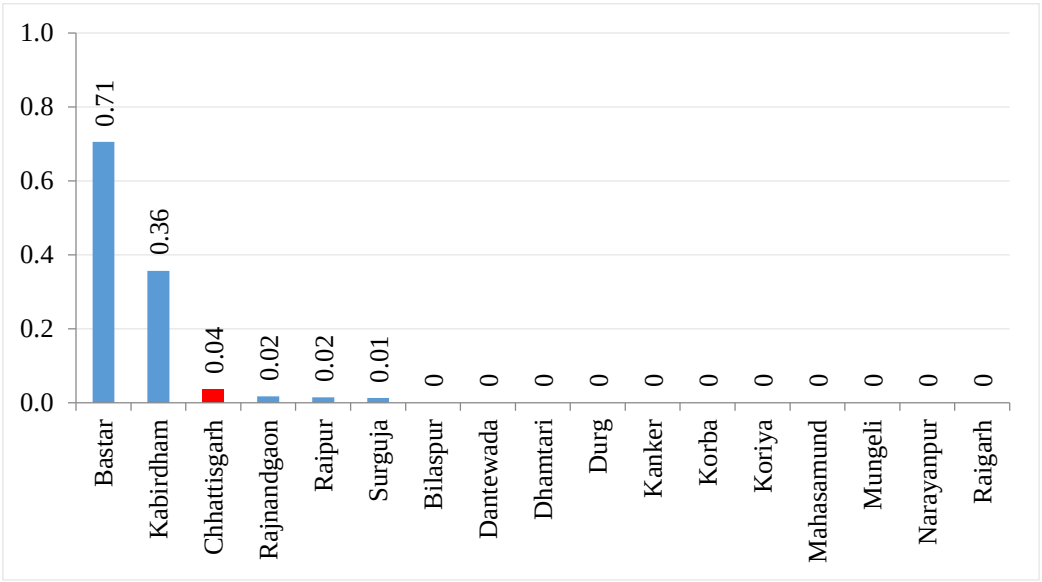
Hepatitis B seroreactivity was found to be higher than the state average of 0.68% in six districts like Kabirdham (2.02), Bilaspur (1.20), Durg (0.92), Raigarh (0.80), Rajnandgaon (0.76) and Korba (0.73). Seven districts recorded less than the state average with Kanker district having the lowest seroreactivity of 0.03% and three districts did not report any HBV seroreactivity.

Figure 14-Syphilis Seroreactivity- By District (%)



There were five districts where the syphilis seroreactivity was found to be higher than the state average of 0.30% which are Kabirdham (0.83), Surguja (0.72), Korba (0.37), Bilaspur (0.36) and Bastar (0.33). Out of the 8 districts which scored less than the state average, Rajnandgaon scored the least with 0.01% of seroreactivity. There were three districts which did not report any syphilis seroreactivity.

Figure 15-Malaria Positivity- By District (%)



The majority of the districts indicated a lower positivity of Malaria than the state positivity of 0.04%. Only two districts which are Bastar (0.71) and Kabirdham (0.36) a higher postivity than the state average. There were 11 districts which did not report any Malaria positivity.

4.4 Component Separation

As depicted in Figure -16, 42.3% 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 (47.1%) in Non-NACO blood banks compared to NACO supported blood banks (28.5%).

Figure 16-Total Blood Collection and Component Separation

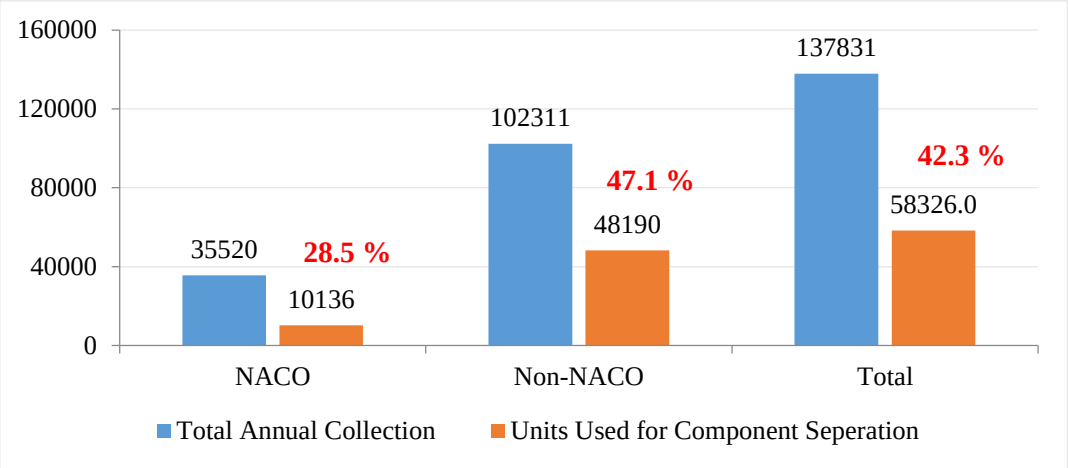
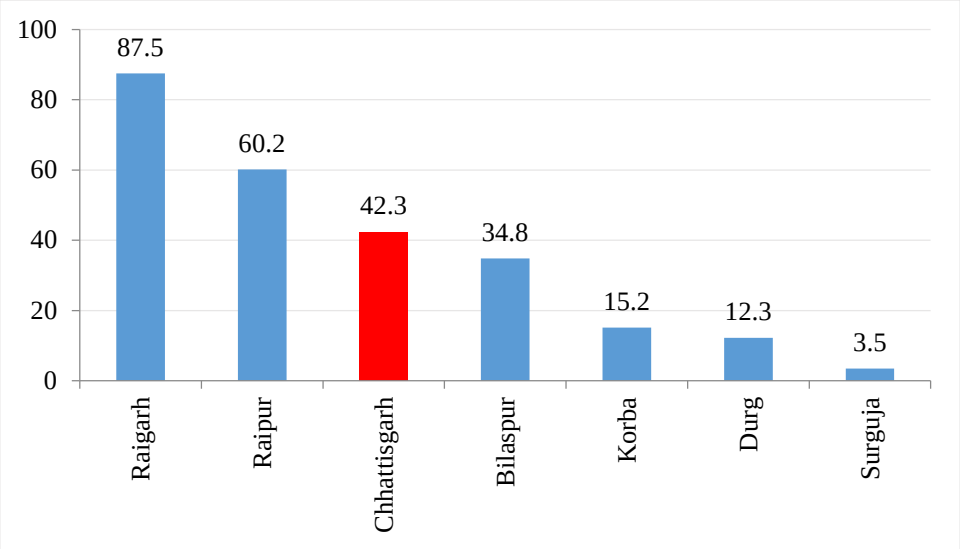


Table 10- Total Annual Collection by BCSUs and Percentage of Component Separation

Districts	Total Annual Collection	Total Annual Collection by BCSUs	Percentage of Component Separation
Bastar	8084	-	-
Bilaspur	33127	30487	34.8
Dantewada	1933	-	-
Dhamtari	1254	-	-
Durg	20897	20897	12.3
Kabirdham	840	-	-
Kanker	3447	-	-
Korba	12285	8725	15.2
Koriya	3377	-	-
Mahasamund	398	-	-
Mungeli	1240	-	-
Narayanpur	115	-	-
Raigarh	14330	1388	87.5
Raipur	70523	70523	60.2
Rajnandgaon	11276	-	-
Surguja	21726	5811	3.5
Chhattisgarh	**204852**	**137831**	**42.3**

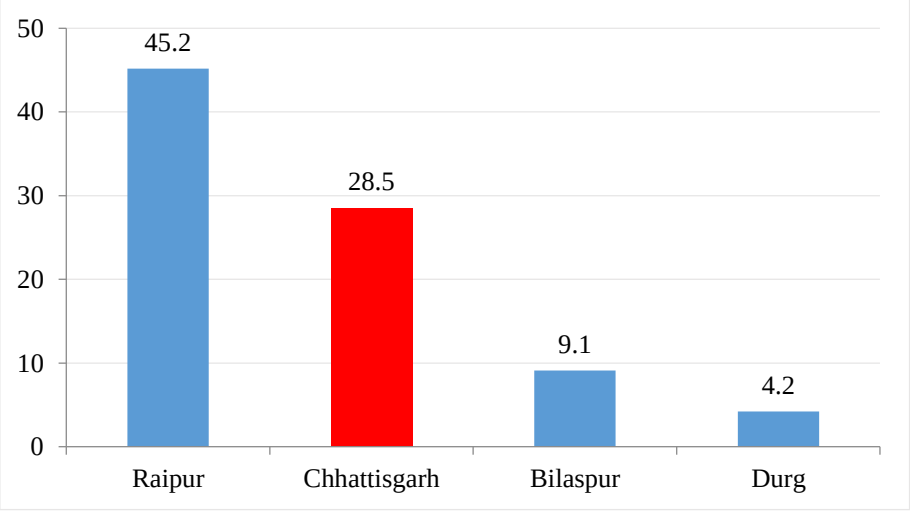
Only six districts out of 16 districts have component separation facilities. Two districts which are Raigarh (87.5%) and Raipur (60.2%) had a higher percentage of component separation than the state average of 42.3%. Four districts which had lower percentage of component separation are Bilaspur (34.8%), Korba (15.2%), Durg (12.3%) and Surguja (3.5%).

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 Raipur district (45.2%) recording more than the state average of 28.5% and Bilaspur (9.1%), and Durg (4.2%) reporting less than the state average.

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



There were 13 districts in Chhattisgarh which did not have any NACO supported blood banks with component separation facility.

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 (85.7%) reported that they adhered to the NBTC guidelines. Availability of document control system was reported by 50% of the blood banks in the state. Around 56% of NACO supported blood banks and 46.2% of Non-NACO blood banks reported that they had a document control system. In terms of Standard Operating Procedures (SOPs) for technical processes, all the blood banks reported that they had SOPs.

Table 11- Availability of Quality Parameters in Blood Banks

Quality Parameters	NACO/NON-NACO		All Blood Banks (n=42)
	NACO supported (n=16)	Non-NACO (n=26)	
Compliance with NBTC guidelines	14	22	36
	87.5 %	84.6 %	85.7 %
Availability of Documental Control System (DCS)	9	12	21
	56.3%	46.2%	50%
SOPs for Technical Processes	16	26	42
	100%	100%	100%
IQC for IH	7	21	28
	43.8%	80.8%	66.7%
IQC for TTI	6	12	18
	37.5%	46.2%	42.9%
QC for kits, reagents and blood bags	7	24	31
	43.8%	92.3%	73.8%
EQAS for IH	-	3	3
	-	11.5%	7.1%

EQAS for TTI	-	3	3
	-	11.5%	7.1%
NABH accreditation for blood banks	-	-	-
	-	-	-
Availability of designated and trained Quality Manager	1	15	16
	6.3%	57.7%	38.1%
Availability of designated and trained Technical Manager	1	19	20
	6.35	73.15	47.6 %
Programme for regular Equipment maintenance	5	26	31
	31.3%	100%	73.8%
Equipment calibration as per regulatory requirement	7	26	33
	43.8%	100%	78.6%

At the state level, Internal Quality Control (IQC) for Immunohematology was reported by 66.7% of the blood banks where around 81% were Non-NACO blood banks and IQC for TTIs was reported by 42.9% 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 similar for immunohematology and TTIs with 7.1%. The state of Chhattisgarh had no blood banks 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 38.1% and 47.6% of the blood banks respectively. Around 74% of the blood banks reported that they had a regular equipment maintenance programme and around 78% reported that they calibrate the equipment as per requirement.

4.6. Reporting and Documentation

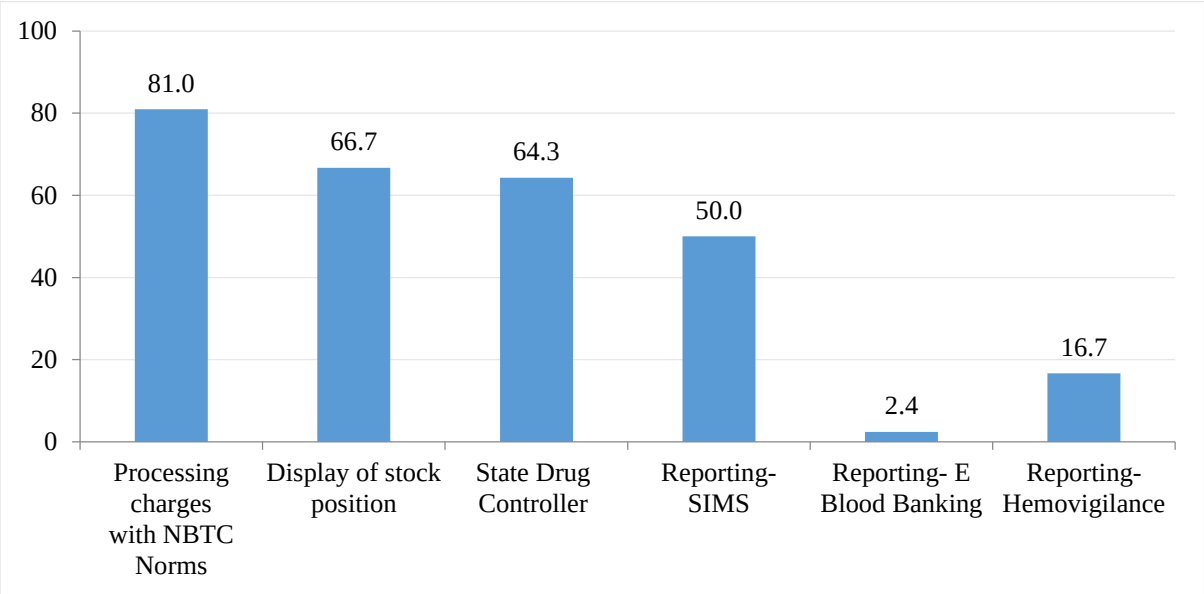
4.6.1. Compliance to NBTC guidelines

In terms of Recovering processing charges, 81% of Blood Banks reported that they were recovering processing charges within NBTC/SBTC norms and 66.7% of blood banks reported that they were displaying stock position in their Blood bank Premises.

4.6.2. Reporting requirements

In terms of reporting requirement, 64.3% of the blood banks submitted regular reports to state drug controller, whereas 50% regularly reported in national strategic information management systems (SIMS). However, only 2.4% regularly reported in E-blood banking both national or state e-blood banking and 16.7% of blood banks reported to be members of National Haemovigilance Program.

Figure 19-Reporting and Documentation

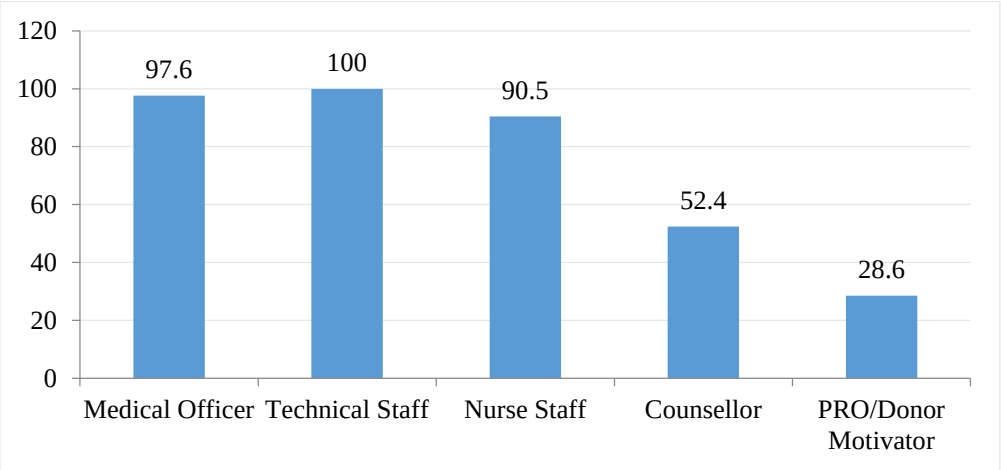


4.7. Human Resources

4.7.1. Availability of staff

The mean number of employees in the blood bank was 10.8 (SD 5.6). It ranges from two employees to 26 employees. Around 97% of blood banks reported to have medical officers, all the blood banks had technical staff and 90.5% of the blood banks had nursing staff. However, only 52.4% had counsellors and 28.6% reported to have PRO/Donor motivators.

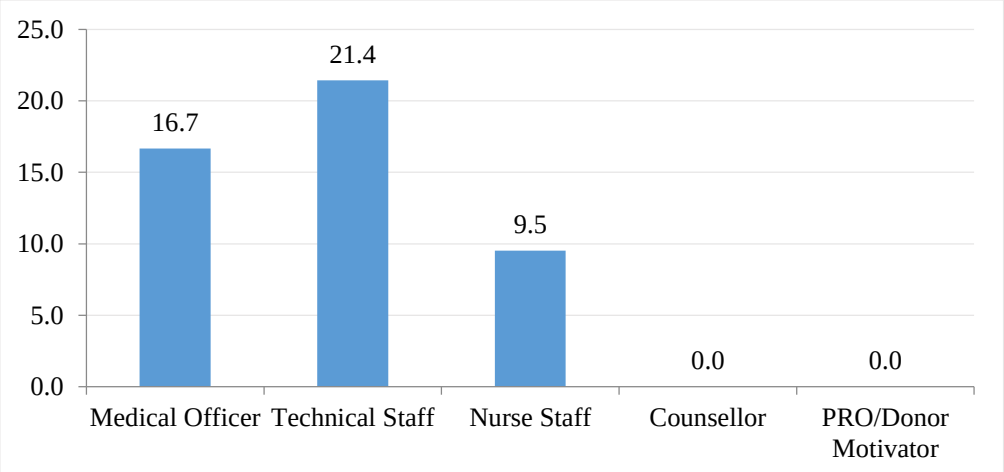
Figure 20-Percentage of BB Manpower (At least one)



4.8. Training of Blood Bank Personnel

According to the assessment, only around 21% of the blood banks reported that they had at least one technical staff trained by NACO/NBTC; 16.7% blood banks reported they had at least one trained medical officer and only 9.5% reported having trained nursing staff. The state reported that didn't have any trained counsellors or PRO/donor motivators in the blood banks.

Figure 21- Percentage of BBs having at least one trained

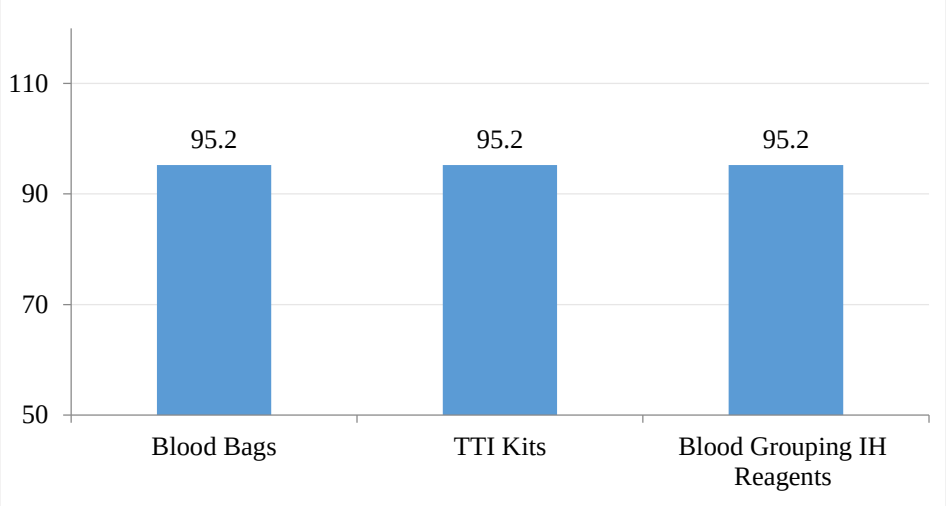


4.9. Equipment and Supplies

4.9.1. Regular supply kits/supplies

Majority of blood banks (95.2%) reported that they had regular supply of blood bags, TTI kits and regular supply of blood grouping reagents.

Figure 22- 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 at least one equipment in working Condition		
S No	**Equipment**	**% BB**
1	Donor Couches	97.6
2	Instrument for Hb Estimation	88.1
3	Blood collection monitor	90.5
4	Quarantine Blood Bank Refrigerator to store untested blood	88.1
5	Container for safe disposal of sharps	83.3
6	Oxygen supply equipment	100.0
7	Computers with accessories and software	71.4
8	General lab centrifuge for samples	90.5
9	Bench top centrifuge for serological testing (Immunohaematology)	85.7
10	Blood transportation box (No. in inventory)	92.9
11	Emergency drugs box / Crash cart	92.9
12	Autoclave machine	90.5
13	Water bath	83.3
14	Blood bank refrigerator (storage of tested blood) with temperature recorder	97.6
15	Automated pipettes	85.7
16	Refrigerated centrifuge	57.1
17	Blood container weighting device	76.2
18	Serology rotator	85.7

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 aspects of blood transfusion services in blood banks, adequate importance and weightage were given to technical aspects and adherence to quality management systems.

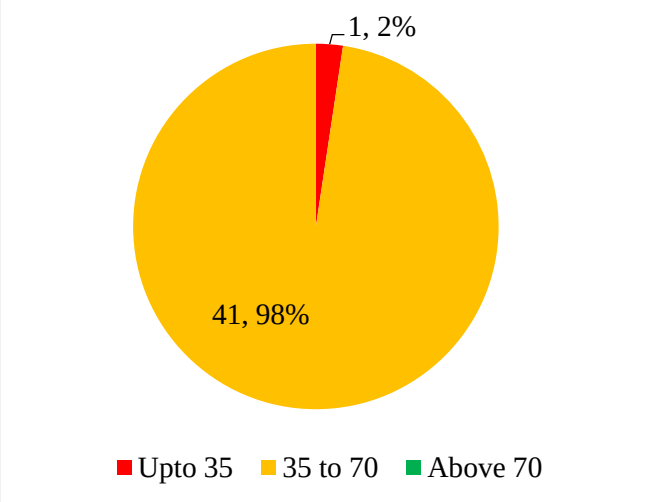
The mean assessment score of blood banks in the state was 53.94 (SD: 10.17). The Non-NACO blood banks scored higher (56.85; SD: 8.15) than the NACO supported blood banks (49.22; SD: 11.56).

Table 13-Mean Assessment score

Type of BB	N	Mean	SD
NACO supported	16	49.22	11.56
Non-NACO	26	56.85	8.15
Total	**42**	**53.94**	**10.17**

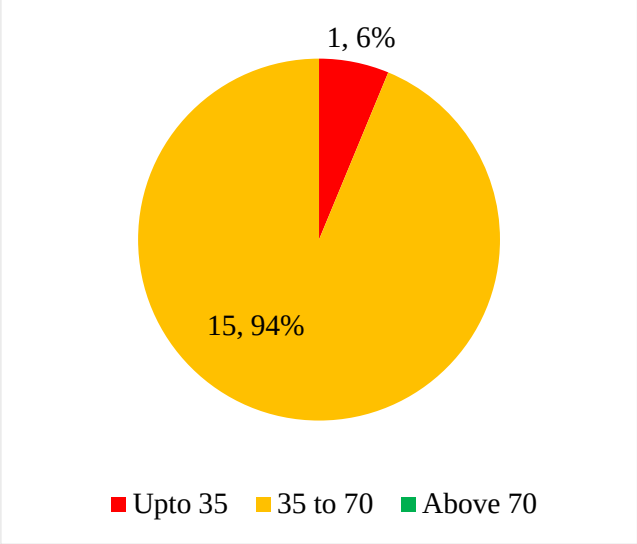
At the state level, almost all the blood banks (41; 98%) scored between 35 to 70. Only one blood bank score less than or equal to 35 and there were no blood banks having a score above 70

Figure 23- Categorisation of Blood banks (n=42)



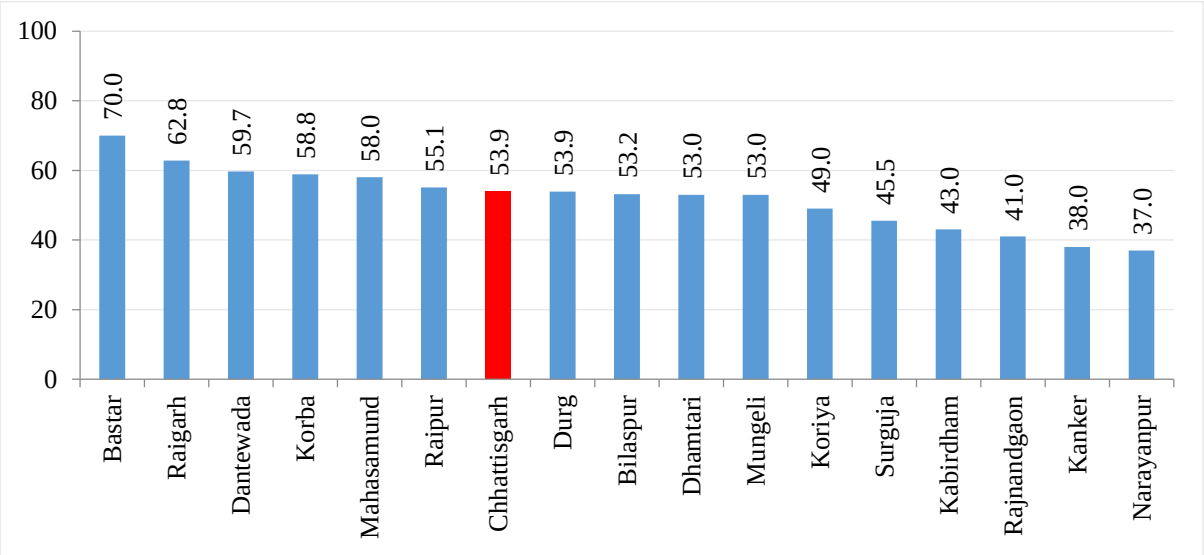
In the NACO supported blood banks 94% of the blood banks scored between 35 to 70 and only one blood banks scored less than or equal to 35. (Refer Figure 24). In terms of Non NACO blood banks, all the blood banks scored between 35 and 70.

Figure 24- Categorisation of NACO Supported BBs (n=16)



Among the 6 districts which scored above the state average of 53.9, Bastar (70) scored the highest followed by Raigarh (62.8), Dantewada (59.7), Korba (58.8), Mahasamund (58.0), and Raipur (55.1). More than half of the blood banks (55.8%) were located in these districts.

Figure 25- Mean Assessment Score – By Districts (All BBs)



The mean scores of NACO supported blood banks were higher than the Non-NACO blood banks in three districts which are Dantewada (63), Korba (65) and Raigarh (66).In terms of Non-NACO blood banks, four districts Bilaspur (62.8), Durg (58.3), Raipur (57.9) and Surguja (47.8) scored higher than the NACO supported blood banks.

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

District	NACO supported	Non-NACO	Total
Bastar	70.0	-	70.0
Bilaspur	38.8	62.8	53.2
Dantewada	63.0	58.0	59.7
Dhamtari	53.0	-	53.0
Durg	40.5	58.3	53.9
Kabirdham	43.0	-	43.0
Kanker	38.0	-	38.0
Korba	65.0	55.8	58.8
Koriya	49.0	-	49.0
Mahasamund	58.0	-	58.0
Mungeli	-	53.0	53.0
Narayanpur	-	37.0	37.0
Raigarh	66.0	61.3	62.8
Raipur	41.3	57.9	55.1
Rajnandgaon	41.0	-	41.0
Surguja	41.0	47.8	45.5
Chhattisgarh	**49.2**	**56.8**	**53.9**

There was only one NACO supported blood bank in Bilaspur which scored less than or equal to 35.There were no blood banks in the state that scored more than 70. Majority of the blood banks scoring between 35 and 70 were from Raipur (12), Bilaspur (4), Durg (4), Dantewada (3), Korba (3), Raigarh (3) and Surguja (3)

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

District	NACO supported	Non-NACO	Total
Bastar	1	-	1
Bilaspur	1	3	4
Dantewada	1	2	3
Dhamtari	1	-	1
Durg	1	3	4
Kabirdham	1	-	1
Kanker	1	-	1
Korba	1	2	3
Koriya	1	-	1
Mahasamund	1	-	1
Mungeli	-	1	1
Narayanpur	-	1	1
Raigarh	1	2	3
Raipur	2	10	12
Rajnandgaon	1	-	1
Surguja	1	2	3
Chhattisgarh	15	26	41

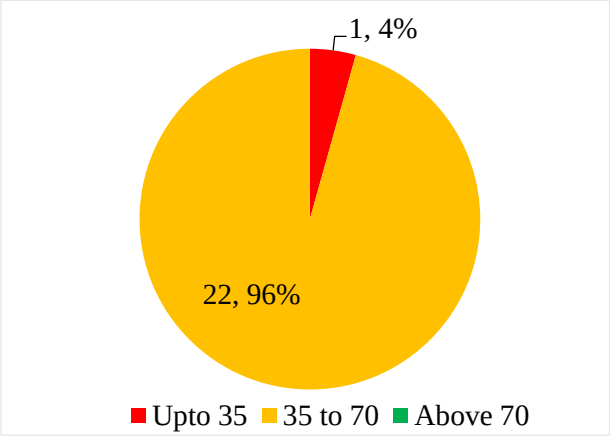
4.10.1 Assessment score by Category of blood banks: The mean score of blood banks with component facilities (54.93; SD: 10.26) was found to be slightly higher than the mean score of those without component facilities (52.74; SD: 10.21).

Table 16- 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	4	39.38	3.42	19	58.21	7.84	23	54.93	10.26
Without BCSU	12	52.50	11.49	7	53.14	8.38	19	52.74	10.21

There were only one blood bank with component separation facility which recorded a score less than or equal to 35. Almost all the blood banks (96%) with component separation facility had a score between 35 and 70. (Refer Fig 26). All the 19 blood banks without component separation facility scored between 35 and 70.

Figure 26- BBs with Component-Score (n=23)



4.10.2 Assessment score by Ownership: The mean assessment score of private owned blood banks (60.10; SD: 6.56) was found to be higher than the NGO/Trust/Charitable (53.39; SD: 9.22) and public owned blood banks (50.94; SD: 11.39). (Refer Table 17).

The Non-NACO blood banks run by public sector (57.33; SD: 7.09) had scored higher compared to NACO supported blood banks public blood banks (49.67; SD: 11.82).

Table 17- Mean assessment score by Ownership

Ownership	NACO supported			Non-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
NGO/Trust/ charitable	1	42.50	-	13	54.23	9.02	14	53.39	9.22
Private	0	-	-	10	60.10	6.56	10	60.10	6.56
Public	15	49.67	11.82	3	57.33	7.09	18	50.94	11.39

Table 18-Mean assessment scores categories by Ownership

Ownership	<=35	36 to 70	Above 70	Total
Public	1	17	-	18
	5.6%	94.4%	-	100%
NGO/Trust/Charitable	-	14	-	14
	-	100%	-	100%
Private	-	10	-	10
	-	100.0%	-	100%
Overall	**1**	**41**	**0**	**42**
	2.4%	**97.6%**	**0**	**100%**

4.10.3 Assessment score of Private Sector Blood Banks: Irrespective of the NACO support status, 57.1% (24) blood banks were owned by private sector, of which, 14 (58.3%) 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 (56.19; SD: 8.73) was higher than the mean score of public owned blood banks (50.94; SD 11.39). Among the private sector, the private sector blood banks (60.10; SD: 6.56) scored higher than the other not-for-profit sector blood banks (53.39; SD: 9.22).

Nevertheless, it is also important to note that the average annual collection was higher in private owned blood banks (5,112 units) compared to public owned blood banks (4,833 units). Similarly, the percentage of voluntary blood donation was higher in public owned blood banks (53%) compared to the private blood banks (38.2%). Of the total private blood banks, 83.3% (20) had component separation facility whereas 16.7% (3) of public blood banks had component separation facility.

4.10.4 Assessment score by Annual Collection: The mean assessment score of blood banks that collected between 3001 to 5000 blood units (56.71; SD: 10.66) was found to be higher than those which collected upto 3000 units of blood (54.06; SD: 8.48) and above 5000 blood

units (52.25; SD: 11.61). In all the categories the mean scores of Non-NACO blood banks was found to be higher than the NACO supported blood banks.

Table 19- Mean assessment score by annual collection

Annual Collection	NACO supported		Non-NACO		Total	
	Mean	SD	Mean	SD	Mean	SD
Up to 3000	49.25	7.50	55.67	8.46	54.06	8.48
3001 to 5000	50.67	13.58	61.25	6.34	56.71	10.66
Above 5000	46.94	13.25	56.50	8.54	52.25	11.61

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 which does not indicate any pattern.

Table 20- Mean assessment score by voluntary blood donation

% VBD	NACO supported		Non-NACO		Total	
	Mean	SD	Mean	SD	Mean	SD
Less than 25	48.90	15.33	55.79	6.24	53.76	9.80
25 to 49	41.50	2.12	58.50	.71	50.00	9.90
50 to 74	-	-	59.81	9.84	59.81	9.84
75 to 90	-	-	55.00	-	55.00	-
Above 90	49.63	10.35	52.67	14.29	50.45	10.85

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 (64.00; SD: 8.32) as compared to those who were not enrolled (53.17; SD: 9.97). Similar situation was found among those blood banks that were part of EQAS for Transfusion-Transmitted Infections (64.00; SD: 8.32) as compared to those who were not enrolled (53.17; SD: 9.97).

It was observed that there were only Non-NACO blood banks which were enrolled in IH and TTI-EQAS. There were no NACO supported blood bank enrolled for IH and TTI-EQAS.

Table 21- Mean assessment score by EQAS enrolment

IH-EQAS	NACO supported			NON-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
YES	-	-	-	3	64.00	8.32	3	64.00	8.32
NO	16	49.22	11.56	23	55.91	7.83	39	53.17	9.97
TTI-EQAS									
YES	-	-	-	3	64.00	8.32	3	64.00	8.32
NO	16	49.22	11.56	23	55.91	7.83	39	53.17	9.97

4.10.7 Assessment score by Accreditation status: There were no blood banks in the state of Chhattisgarh which are accredited by National Accreditation Board of Hospitals and Health care Providers (NABH).

Table 22- Mean assessment score by Accreditation

NABH Accreditation	NACO supported			Non-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
YES	-	-	-	-	-	-	-	-	-
NO	16	49.22	11.56	26	56.85	8.15	42	53.94	10.17

The list of blood banks under different categories of score is given in Tables 23 and 24.

Table 23- Distribution of Blood banks by Districts and mean assessment score categories

Score Category				
District	Up to 35	35 to 70	Above 70	Total
Bastar	-	1	-	1
Bilaspur	1	4	-	5
Dantewada	-	3	-	3
Dhamtari	-	1	-	1
Durg	-	4	-	4
Kabirdham	-	1	-	1
Kanker	-	1	-	1
Korba	-	3	-	3
Koriya	-	1	-	1
Mahasamund	-	1	-	1
Mungeli	-	1	-	1
Narayanpur	-	1	-	1
Raigarh	-	3	-	3
Raipur	-	12	-	12
Rajnandgaon	-	1	-	1
Surguja	-	3	-	3
Chhattisgarh	1	41	0	42

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

Score Category						
District	NACO supported			Non-NACO		
	Up to 35	35 to 70	Above 70	Up to 35	35 to 70	Above 70
Bastar	-	1	-	-	-	-
Bilaspur	-	1	-	-	3	-
Dantewada	-	1	-	-	2	-
Dhamtari	-	1	-	-	-	-
Durg	-	1	-	-	3	-
Kabirdham	-	1	-	-	-	-
Kanker	-	1	-	-	-	-
Korba	-	1	-	-	2	-
Koriya	-	1	-	-	-	-
Mahasamund	-	1	-	-	-	-
Mungeli	-	-	-	-	1	-
Narayanpur	-	-	-	-	1	-
Raigarh	-	1	-	-	2	-
Raipur	-	2	-	-	10	-
Rajnandgaon	-	1	-	-	-	-
Surguja	-	1	-	-	2	-
Chhattisgarh	1	15	0	0	26	0

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 Chhattisgarh 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 16 NACO and 26 Non-NACO blood banks which were included in the review are approximately 80% of the total blood banks (52) existing in the state. The annual collection of these blood banks was 204,852 units which is approximately 80% 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 0.04 units to 3.3 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 the blood collected by blood banks with the component facility (67.3%) was much higher than the collection collected by blood banks without component facility (32.7%). Though there has been an increase in the percentage of voluntary blood donation over the years (around 44% in 2015), there is still a huge variation between districts that ranges from 5.2% 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.

There were 9 districts out of 27 districts namely Bametara, Balod, Baloda Bazar, Balrampur, Bijapur, Gariyaband, Kondagaon, Sukma and Surajpur which didn't report to have any blood banks. Ten districts out of the remaining 18 districts had more than the state average of 2

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.

Half 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 53.94 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)
Bastar	Mahararni Hospital Jagdalpuar	Non BCSU	Public	8084	70
Bilaspur	Shri Rawatpura Sarkar Lok Kalyan Trust,In M/S.Bilasa Blood Bank	BCSU	NGO/Trust/ Charitable	10150	63
	Ekta Blood Bank & Components	BCSU	NGO/Trust/ Charitable	8736	55.5
	Chhattisgarh Institute Of Medical Science Blood Bank	BCSU	Public	7430	34.5
	Apollo Hospital Blood Bank	BCSU	Private	4171	70
	Civil Surgeon District Hospital	Non BCSU	Public	2640	43
Dantewada	NMDC Apollo Hospital Blood Bank	Non BCSU	Public	1675	65
	NMDC Project Hospital	Non BCSU	Public	258	51
	District Hospital Blood Bank	Non BCSU	Public	0	63
Dhamtari	District Hospital Blood Bank	Non BCSU	Public	1254	53
Durg	Chandulal Chandrakar Memorial Hospital Blood Bank	BCSU	Private	9509	62.5
	Durg District Hospital Blood Bank	BCSU	Public	7887	40.5
	C.M. Medical College And Hospital Blood Bank	BCSU	Private	2117	52
	BSR Blood Bank	BCSU	Private	1384	60.5
Kabirdham	District Level Blood Bank	Non BCSU	Public	840	43

Kanker	Blood Bank Kankar	Non BCSU	Public	3447	38
Korba	Bilash Blood Bank	BCSU	NGO/Trust/ Charitable	8725	55.5
	Blood Bank Indira Gandhi District Hospital	Non BCSU	Public	3336	65
	Nehru Centenary Hospital Blood Bank	Non BCSU	Public	224	56
Koriya	District Hospital Bajkunthpur	Non BCSU	Public	3377	49
Mahasamund	Government District Hospital Blood bank	Non BCSU	Public	398	58
Mungeli	Christian Hospital Blood Bank	Non BCSU	NGO/Trust/ Charitable	1240	53
Narayanpur	Vivekananda Arogya Dham, Ramakrishna Mission Ashram	Non BCSU	NGO/Trust/ Charitable	115	37
Raigarh	Govt K G Hospital Blood Bank	Non BCSU	Public	8594	66
	Sewa Blood Bank	Non BCSU	NGO/Trust/ Charitable	4348	55
	O.P. Jindal Hospital & Research Centre Blood Bank	BCSU	NGO/Trust/ Charitable	1388	67.5
Raipur	Model Blood Bank	BCSU	Public	13478	40
	City Blood Bank	BCSU	Private	12353	67
	Rajdhani Blood Bank	BCSU	NGO/Trust/ Charitable	10116	67
	The Chhattisgarh State Branch Of Indian Red Cross Society	BCSU	NGO/Trust/ Charitable	6725	42.5
	Srishti Blood Bank	BCSU	Private	5768	49.5
	Bilasa Blood Bank	BCSU	NGO/Trust/ Charitable	5701	49.5
	S.S.D.Blood Bank	BCSU	Private	4914	59
	Thawait Blood Bank	BCSU	Private	3237	61
	Shree Narayana Hospital Blood	BCSU	Private	2829	65

	Bank				
	Ashirwad Blood Bank	BCSU	NGO/Trust/ Charitable	2527	58
	Raipur Institute Of Medical Science	BCSU	NGO/Trust/ Charitable	1438	48.5
	Narayana Hrudayalaya MMI Blood Bank	BCSU	Private	1437	54.5
Rajnandgaon	Blood Bank District Hospital Rajnandgaon	Non BCSU	Public	11276	41
Surguja	Civil Surgeon Cum Hospital District Hospital Blood Bank	Non BCSU	Public	7958	41
	Holy Cross Hospital Blood Bank	Non BCSU	NGO/Trust/ Charitable	7957	55
	Tej Blood Bank	BCSU	NGO/Trust/ Charitable	5811	40.5

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	
		Public (Other than ministry of health e.g. PSU, Army etc.)	
		NGO/Trust/Charitable – NACO Supported	
		NGO/Trust/Charitable	
		Privates	
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

C1.	Which of the following tests are performed for determination of ABO and Rh (D) groups and what techniques are followed?	**Blood Group (Tick as applicable)**		**Rh Type** (Tick as applicable**)**
		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		Inter-lab	

	participant in	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			Yes	

	you be willing to participate in future?	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**