A Report on the

"Assessment of Blood Banks in Telangana, India"

National AIDS Control Organization (NACO) and
National Blood Transfusion Council (NBTC),
Ministry of Health and Family Welfare, Government of India
in collaboration with
U.S Centers for Disease Control and Prevention (HHS/CDC)
Division of Global HIV and TB (DGHT), India
Christian Medical College, Vellore
&
Christian Medical Association of India (CMAI), New Delhi

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

Table of Contents

Tables and Figures

Tables

Figures

Executive Summary

Blood Banks in Telangana

According to Central Drugs Standard Control Organization (CDSCO), there were 151 blood banks in Telengana in 2015. The assessment exercise identified 153 functional blood banks across the state excluding one military blood bank. Of the 153 blood banks, 43(28%) were supported by National AIDS Control Organization, Ministry of Health and Family Welfare, Government of India and the remaining 110(72%) were Non-NACO blood banks.

The highest number of blood banks was in Hyderabad (68) followed by Ranga Reddy (24), Khammam (13), Karimnagar (10) and Warangal (10). In 2016, there are 10 districts in the state of Telangana. Around 81% (125) of all the blood banks (n=153) in the state were in 4 districts that are, Hyderabad (68), Ranga Reddy (24), Khammam (13), Karimnagar (10) and Warangal(10).

Considering the number of blood banks per one million population, districts such as, Warangal (2.8), Nizamabad (2.7), Karimnagar (2.6), Medak (2.0), Adilabad (1.8), Nalgonda(1.4), and Mahbubnagar(1.2), recorded less than the state average of 4.3 blood banks per 1,000,000 (one million) population..

In this assessment, 123 blood banks (123 blood banks (43 NACO supported and 80 Non-NACO) that submitted the assessment forms in complete were included in the analysis.

Description of blood banks

- Around 55% (68) of the blood banks in the state had component separation facility.
- The not-for-profit sector owned around 43% (53) of blood banks followed by private (35%) and public (22%).
- The majority (25; 58%) of NACO supported blood banks were owned by the public sector and the remaining 42% (18) are owned by non-profit/not-for-profit sector such as NGOs, charitable trusts, societies, foundations etc..
- The majority of the blood banks (85; 69%) were attached to hospitals, and the remaining (38; 31%) were standalone blood banks
- The majority of the blood banks (89; 72.4%) had a valid and current license, and the remaining (34; 27.6%) had applied for renewal. Around 84% (67) of Non-NACO blood banks had a valid licence whereas only 51% (22) of NACO supported blood banks had a valid licence.

Annual Collection and Voluntary Blood Donation

- During January 2015 to December 2015, the annual blood collection from all the blood banks that reported was 425,364 of which 62.5% (2, 65,857) units were through voluntary blood donations and the remaining were from replacement donations.
- The average annual collection blood units in the state was 3,636 units. The average annual collection of NACO supported blood banks was found to be higher (4,511units) than the Non-NACO blood banks (3,145 units).
- Blood banks with component separation units recorded a average higher collection of 5,244 units compared to blood banks without blood component separation units which was 1,625 units.
- The NACO supported blood banks collected 44.5% (18,9481 units) of the total collection, of which 81.3% (154,058) units were through voluntary blood donation. The Non-NACO blood banks collected 235,883 (55.5%) units of which 47.4% (111,799) units were through voluntary blood donation..

Transfusion Transmitted Infections

- HIV seroreactivity was found to be 0.14%, Hepatitis-C was 0.24%, Hepatitis-B 0.67%, Syphilis 0.04% and Malaria 0.03%. However, there is a huge variation between districts in the year 2015.

Component Separation

- Around 68.3% 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 (73.2%) in Non-NACO blood banks compared to NACO supported blood banks (61.8%).

Quality Management Systems

- 87.8% of the blood banks reported that they adhered to the NBTC guidelines.
- Availability of document control system was reported by 56% of the blood banks in the state. Around 44% of NACO supported blood banks and 62.5% of Non-NACO blood banks reported they had a document control system.
- More than 95% of blood banks reported to have standard operating procedures (SOPs) for technical processes.
- Practice of internal quality control (IQC) for Immunohematology was reported by 81.3% of the blood banks and IQC for TTIs was reported by 51.2% of all the blood banks, with slight variation between NACO supported and Non-NACO blood banks.
- Around 91% of the blood banks reported carrying out quality control for kits, reagents and blood bags.

- Only 11.4% and 8.9% of the blood banks in state have enrolled themselves in External Quality Control Systems (EQAS) by recognized providers for immunohematology and TTIs respectively.
- Only 2 blood banks that participated in the assessment were accredited by National Accreditation Board for Hospitals & Healthcare Providers (NABH).
- Designated and trained Quality Managers and Trained Technical managers were available only in 56.9% and 61% of the blood banks respectively.
- More than 90% of the blood banks reported that they had a regular equipment maintenance programme and around 98% reported that they calibrate the equipment as per requirement.

The current status of blood banks based on the assessment

- The mean assessment score of blood banks in the state was 62.11 (SD: 9.33). No significant difference was found between Non-NACO blood banks (62.11; SD: 9.65) and NACO supported blood banks (62.09; SD: 8.82).
- At the state level, the majority of blood banks (104; 84%) scored between 35 to 70, followed by 18 (15%) blood banks which scored above 70, and only one blood bank scored less than or equal to 35.
- Around 86% of NACO supported and 84% Non-NACO blood banks scored between 35 and 70. Around, 14% of NACO supported blood banks and 15% of Non-NACO blood banks scored more than 70%.
- Among the 10 districts, Medak (71.7) scored the highest and Adilabad (57.2) scored the least.
- Of the 18 blood banks that scored more than 70 score, 12 (66.6%) were Non-NACO blood banks. The majority of blood banks that scored above 70 were from Hyderabad (8) followed by Ranga Reddy (3), Karimnagar (2), Mahbubnagar(2) and Medak(2).
- The mean score of blood banks with component facilities (62.60; SD: 9.86) was found to be higher than the mean score of those without component facilities (61.49; SD: 8.69).
- The mean assessment score of private owned blood banks (63.21; SD: 11.79) was found to be higher than not-for-profit (NGO/Trust/Charitable) sector blood banks (62.37; SD: 6.37) and public sector blood banks (59.83 SD: 9.77).
- However, NACO supported blood banks run by not-for-profit sector had scored higher (64.69; SD: 6.40) compared to Non-NACO NGO/Trust/Charitable blood banks (61.17; SD: 6.11).
- The mean assessment score of blood banks that collected more than 5000 blood units (64.60; SD: 9.20) was found to be higher than those which collected between 3000 and 5000 (63.32; SD: 5.91) and less than 3000 blood units (62.14; SD: 8.02).
- The mean assessment score of blood banks that collected more than 90% voluntary blood donation was 64.53 (SD: 8.29) which is relatively higher than the other groups.

- The mean score was found to be higher among the blood banks that were part of EQAS for immunohematology (71.36; SD: 7.25) as compared to those who were not enrolled (60.92; SD: 8.92).
- Similarly, blood banks that were part of EQAS for Transfusion-Transmitted Infections (73.50; SD: 6.10) as compared to those who were not enrolled (60.99; SD: 8.85).
- More number of Non-NACO blood banks were enrolled in IH and TTI-EQAS.
- Only 2 blood banks in the state were accredited by National accreditation board of hospitals and health care providers (NABH) compared to those that were not accredited.

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 Telangana

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=68) and 2. Blood banks without component separation facility (n=55). 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

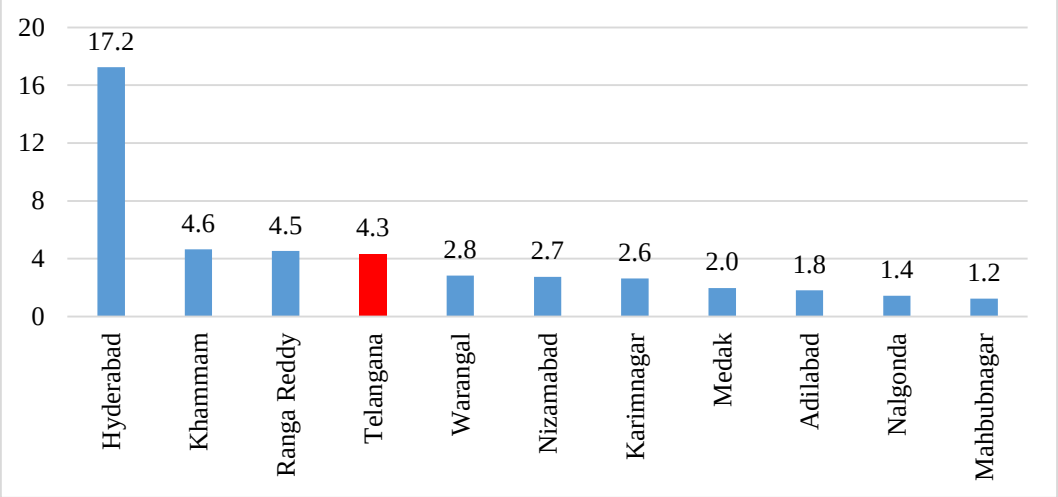
According to CDSCO, there were 151 blood banks in the state of Telangana in 2015 (CDSCO, 2015). However, the assessment exercise identified 153 functional blood banks(43 NACO Supported and 110 Non-NACO) across the state. Of the total functional blood banks, 43 NACO supported - 34.9% and 80 Non-NACO – 65.1%) 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
Adilabad	3	2	5
Hyderabad	15	53	68
Karimnagar	4	6	10
Khammam	4	9	13
Mahbubnagar	4	1	5
Medak	3	3	6
Nalgonda	3	2	5
Nizamabad	3	4	7
Ranga Reddy	1	23	24
Warangal	3	7	10
Telangana	**43**	**110**	**153**

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. Hyderabad (68) had the highest number of blood banks followed by Ranga Reddy (24), Khammam (13), Karimnagar (10) and Warangal (10). In terms of NACO supported blood banks, Hyderabad(15) had the highest number of blood banks followed by Karimnagar(4), Khammam(4), and Mahbubnagar(4). Around 81% (125) of all the blood banks (n=153) in the Telengana were in 5 districts that are, Hyderabad, Ranga Reddy, Khammam, Karimnagar and Warangal.

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



Considering the number of blood banks per one million population, districts such as, Warangal (2.8), Nizamabad (2.7), Karimnagar (2.6), Medak (2.0), Adilabad (1.8), Nalgonda (1.4), and Mahbubnagar (1.2), recorded less than the state average of 4.3 blood banks per 1,000,000 (one million) population.

4.1 Basic details of blood banks (n=123)

As indicated earlier, 123 blood banks (43 NACO supported and 80 Non-NACO) that submitted the assessment forms were included in the analysis.

4.1.1 Category of Blood Banks: Out of 43 NACO supported blood banks 37.2% (16) of the blood banks had component separation facility. Out of 80 Non-NACO blood banks 65% (52) were with component separation facility.

Table 4 - Basic details of blood banks

Specifics	Description	NACO Supported	Non-NACO	Total
Type of BB	With components	16(37.2%)	52(65.0%)	68(55.3)%
	Without components	27(62.8%)	28(35.0%)	55(44.7%)
Ownership	NGO/Trust/Charitable	18(41.9%)	35(43.8%)	53(43.1%)
	Private	-	43(53.8%)	43(35.0%)
	Public	25(58.1%)	2(2.5%)	27(22.0%)
Licence	Valid	22(51.2%)	67(83.8%)	89(72.4%)
	Under Renewal	21(48.8%)	13(16.3%)	34(27.6%)
Attachment	Attached to Hospital	32(74.4%)	53(66.3%)	85(69.1%)
	Attached to lab	-	-	-
	Stand alone	11(25.6%)	27(33.8%)	38(30.9%)

At the District level, Hyderabad (37) has the highest number of component separation facility followed by Ranga Reddy (12), Karimnagar (5) and Warangal (5). Around 54% of the blood banks with component separation facility were in Hyderabad. However, Medak and Nalgonda districts did not have blood banks with component separation facility.

4.1.2 *Ownership:* As depicted in Table:-4, around 43% (53) of blood banks were owned by not-for-profit sector followed by private (43, 35%) and public (27, 22%). The majority (25; 58%) of NACO supported blood banks were owned by the public sector and the remaining 42% (18) are owned by non-profit/not-for-profit sector such as NGOs, charitable trusts, societies, foundations etc. The private sector had a higher proportion (44%) of blood

component separation facility than the NGO/Trist/Charitable (42.6%) and public sector (5.4%). Among the NACO supported blood banks, the not-for-profit sector had a higher (90.7%) proportion of component separation facilities compared to the public sector (13.2%).

Around 75% of all not-for-profit blood banks (n=53) were clustered in four districts that are, Hyderabad (22), Ranga Reddy (9), Warangal (5) and Karimnagar (4). Around 84% of the private owned blood banks were clustered in three districts that are, Hyderabad (23), Ranga Reddy (9), and Khammam (4). Similarly, around 60% of public owned blood banks were in three districts that are, Hyderabad (10), Khammam (4) and Adilabad (2). (Refer Table - 5)

Table 5 - District wise list of blood banks by Ownership

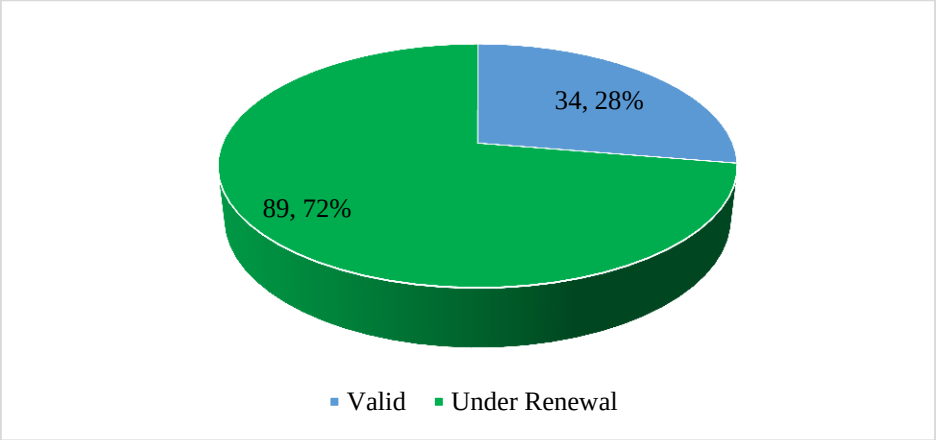
District	Public	%	Not-for-profit	%	Private	%	Total
Adilabad	2	40	2	40	1	20	5
Hyderabad	10	18.2	22	40	23	41.8	55
Karimnagar	2	22.2	4	44.4	3	33.3	9
Khammam	4	40	2	20	4	40	10
Mahbubnagar	2	40	2	40	1	20	5
Medak	2	66.7	1	33.3	-	-	3
Nalgonda	1	25	2	50	1	25	4
Nizamabad	2	33.3	4	66.7	-	-	6
Ranga Reddy	-	-	9	50	9	50	18
Warangal	2	25	5	62.5	1	12.5	8
Telangana	**27**	**43.1**	**53**	**34.9**	**43**	**22**	**123**

4.1.3 ***Organizational Attachment:*** The majority of the blood banks (85; 69%) were attached to hospitals, and the remaining (38; 31%) were standalone blood banks.

The majority of the NACO supported (32; 74.4%) and Non-NACO (53; 66.3%) blood banks were attached to hospitals and only 25.6% and 33.7% of NACO supported and Non-NACO respectively were standalone blood banks. Further analysis indicated that 96.3% (26) of the blood banks in the public sector, 95.3% (41) of blood banks in the private sector and only 34% (18) of blood banks in the not-for-profit sector, were attached to hospitals. In the not-for-profit sector, 66% of blood banks were standalone.

4.1.4 ***License details of blood banks:*** The license status was categorized as “valid” which means that the blood bank has current and active license; and “deemed renewal” which means that the blood bank had applied for renewal which is pending. The majority of the blood banks (89; 72.4%) had a valid and current license, and the remaining (34; 27.6%) had applied for renewal. Around 84% (67) of Non-NACO blood banks had a valid licence whereas only 51% (22) of NACO supported blood banks had a valid licence. Similarly, 86% (37) of private blood banks and around 72% (38) of not-for-profit blood banks had a valid and active license.

Figure 2 - License Status (n=123)



The majority of those blood banks (32; 94%) which have reported as “deemed renewal” had their last inspection by licencing authority during the last one year; one each blood bank had their inspection between the last 1 to 2 years, and 2 to 3 years.

4.2 Annual Blood Collection and Voluntary Blood Donation

According to WHO, it is estimated that blood donation by 1% of the population can meet a nation's most basic requirements for blood (WHO, 2016b), which means that the state with a population of 35,193,978, currently needs around 351,939 units of blood. But since Telengana is producing 425,364 units of blood, it is exceeding the basic requirement of blood by 20%.

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 425,364 of which 62.5% (265,857) units were through voluntary blood donations and the remaining were from replacement donations.

Figure 3 - Annual Collections and Voluntary Donation

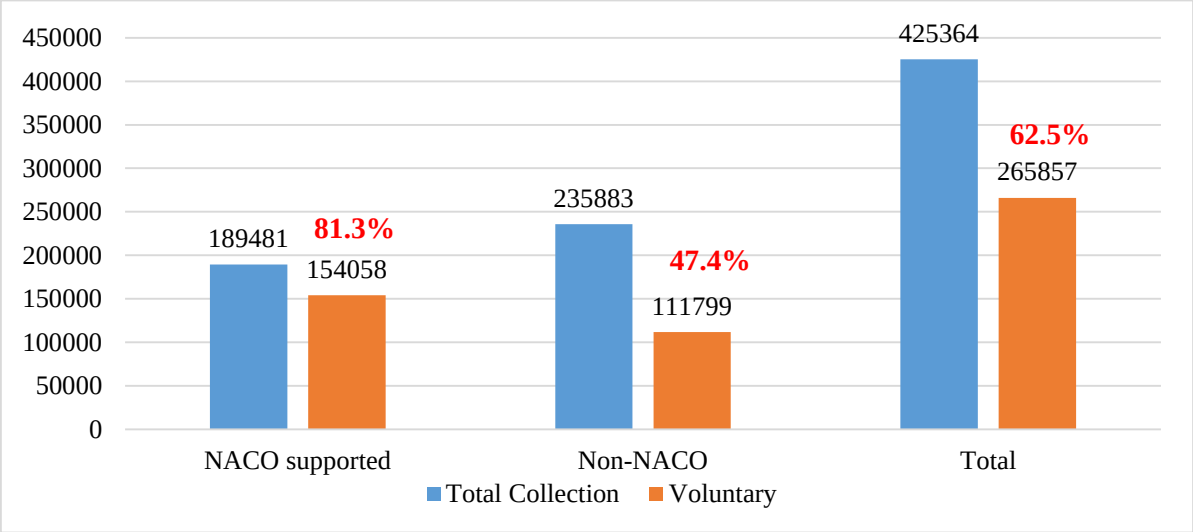
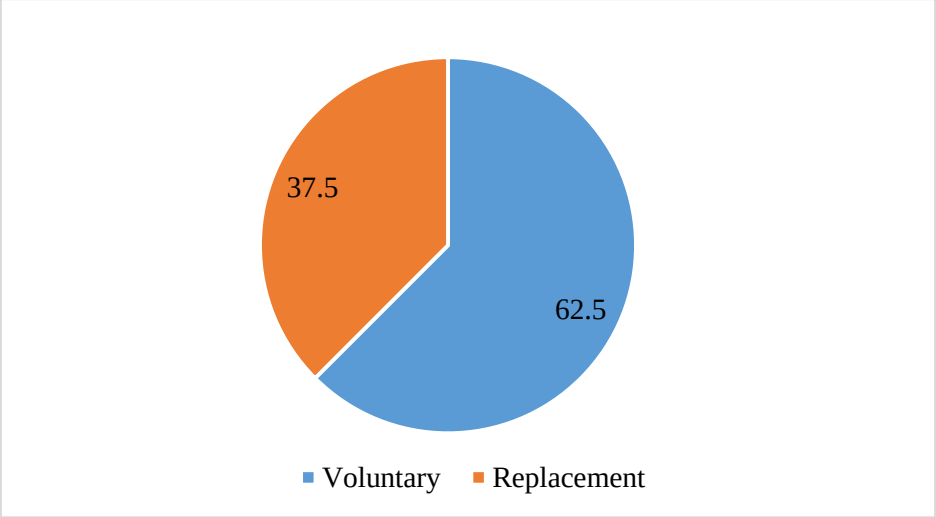


Figure 4 - Type of Blood Donation (Voluntary vs Replacement Donation %)



The average annual collection blood units in the state was 3,636 units. The average annual collection of NACO supported blood banks was found to be higher (4,511units) than the Non-NACO blood banks (3,145 units).

Table 6 - Average Annual collection

District	NACO Supported	Non-NACO	All BBs
Adilabad	3408	3676	3515
Hyderabad	7484	3701	4720
Karimnagar	3055	3980	3569
Khammam	1871	3091	2549
Mahbubnagar	2969	1931	2762
Medak	1537	.	1537
Nalgonda	2395	1511	2174
Nizamabad	2523	1937	2230
Ranga Reddy	667	2129	2043
Warangal	7622	2303	4582
Telangana	**4511**	**3145**	**3,636**

Similarly, the blood banks with component separation units recorded a average higher collection of 5,244 units compared to blood banks without blood component separation units which was 1,625 units. However, the variation in the collection was found to be very high across and within districts.

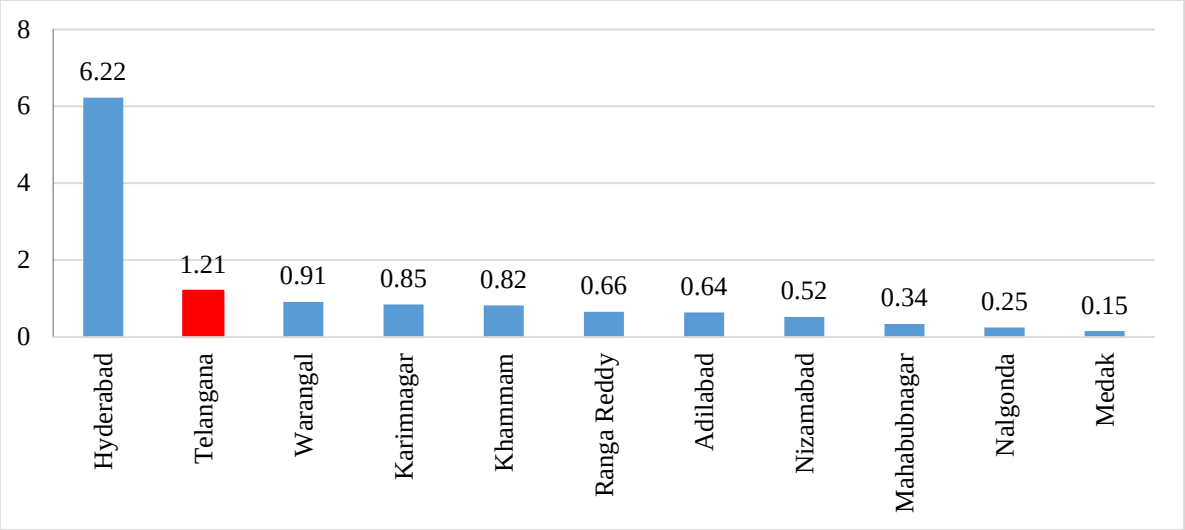
The NACO supported blood banks collected 44.5% (189,481 units) of the total collection, of which 81.3% (154,058) units were through voluntary blood donation. The Non-NACO blood banks collected 235,883 (55.5%) units of which 47.4% (111,799) units were through voluntary blood donation. Blood banks with component separation facility collected the majority (80.1%) of blood units (340,840) and the remaining 19.9% (84,524) were collected by blood banks without the component facility. Similarly, blood banks owned by not-for-profit sector collected 48.7% (206,970) of the total collection followed by the private sector 31.5% (133,938) and public sector blood banks (19.9%, 84,456).

Table-7 indicates the district-wise details of the total annual collection, voluntary and replacement donation in the state of Telangana. Blood banks reported a varying proportion of VNRBD ranging from 63 to 100 percent.

Table 7 - Annual blood collection and percentage of VBD

District	Voluntary Donation	Replacement Donation	Annual Collection	VBD %
Adilabad	16896	680	17576	96.1
Hyderabad	133647	111777	245424	54.5
Karimnagar	26676	5442	32118	83.1
Khammam	11232	11706	22938	49.0
Mahbubnagar	13073	735	13808	94.7
Medak	4610	0	4610	100.0
Nalgonda	8697	0	8697	100.0
Nizamabad	7443	5939	13382	55.6
Ranga Reddy	17487	17247	34734	50.3
Warangal	26096	5981	32077	81.4
Telangana	**265,857**	**159,507**	**425,364**	**62.5**

Figure 5 - Annual Collection per 100 population- District wise

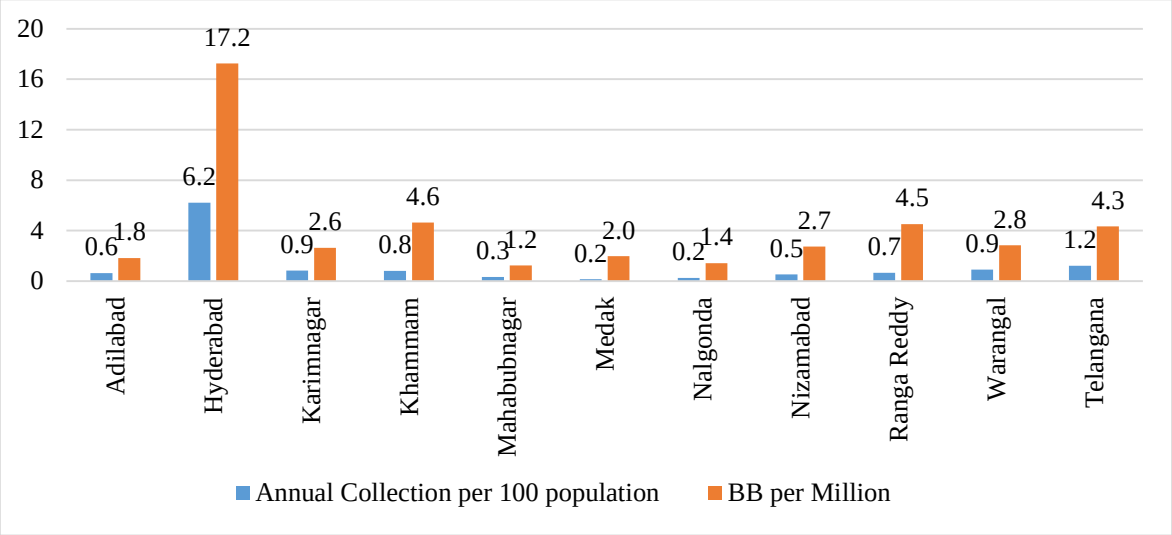


The annual collection of blood units per 100 individuals was found to be around 1.21% in the state, which is meeting the WHO suggested requirement that 1% of the population can meet a nation's most basic requirements for blood. However, there is a huge disparity in the collection of blood between districts. Except Hyderabad, all the districts have collected less than the state average of 1.21 units per 100 population. Most importantly, all the districts have collected less than one unit per 100 population. Mahbubnagar (0.34), Nalgonda (0.25) and Medak (0.15) districts collected less than 0.5 units per 100 population. (Refer Fig-5)

Figure 6 illustrates the district wise comparative information of annual collection per 100 population and number of blood banks per one million populations. This indicates that the state had 4.3 blood banks per million population that collected around 1.2 units per 100 population at the ratio of 4.3 BB: 1.2 blood unit. While considering this ratio s reference,

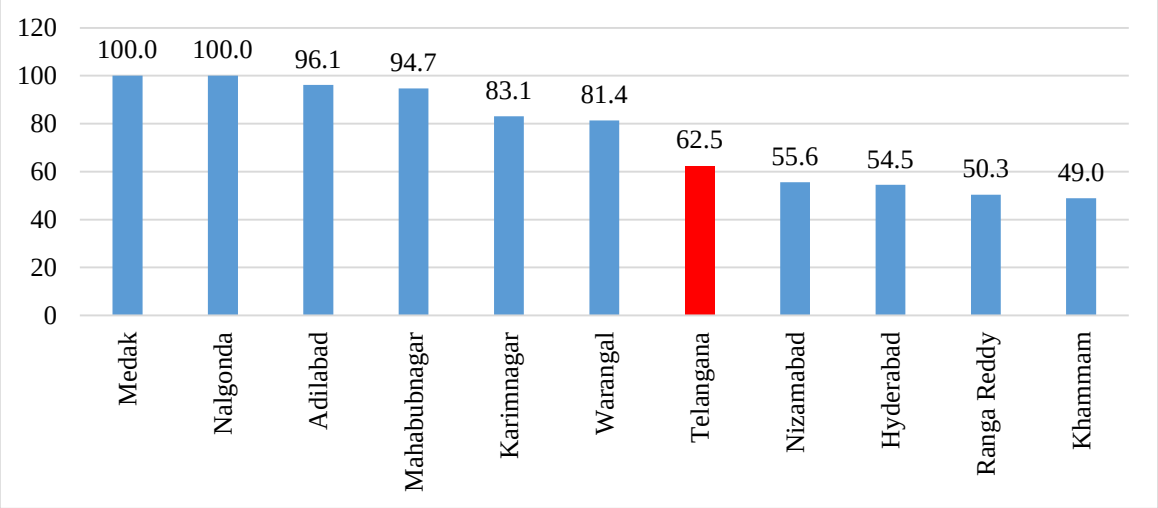
Khammam, Medak, Ranga Reddy, Nalgonda, and Nizamabad districts are collecting less volume of blood for the number of blood banks.

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



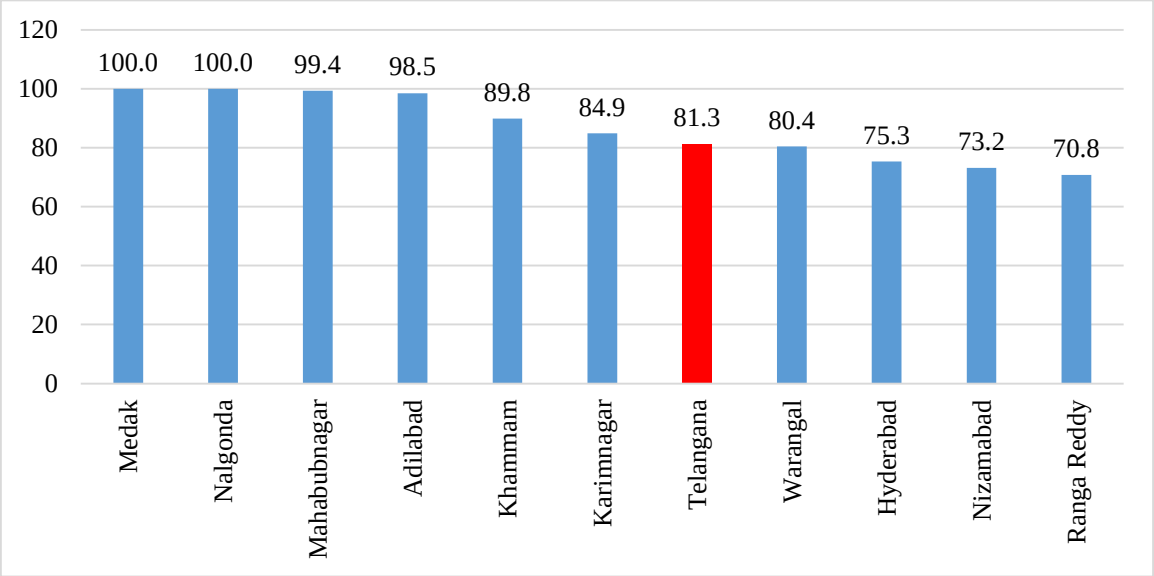
4.2.2 ***Voluntary blood donation:*** As depicted in Figure-7, six districts have collected more than the state average of 62.5%. Medak and Nalgonda districts collected 100% voluntary donation. Nizamabad (55.6), Hyderabad (54.5), Ranga Reddy (50.3) and Khammam (49.0) districts collected less than 60% voluntary blood donation during January to December 2015.

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



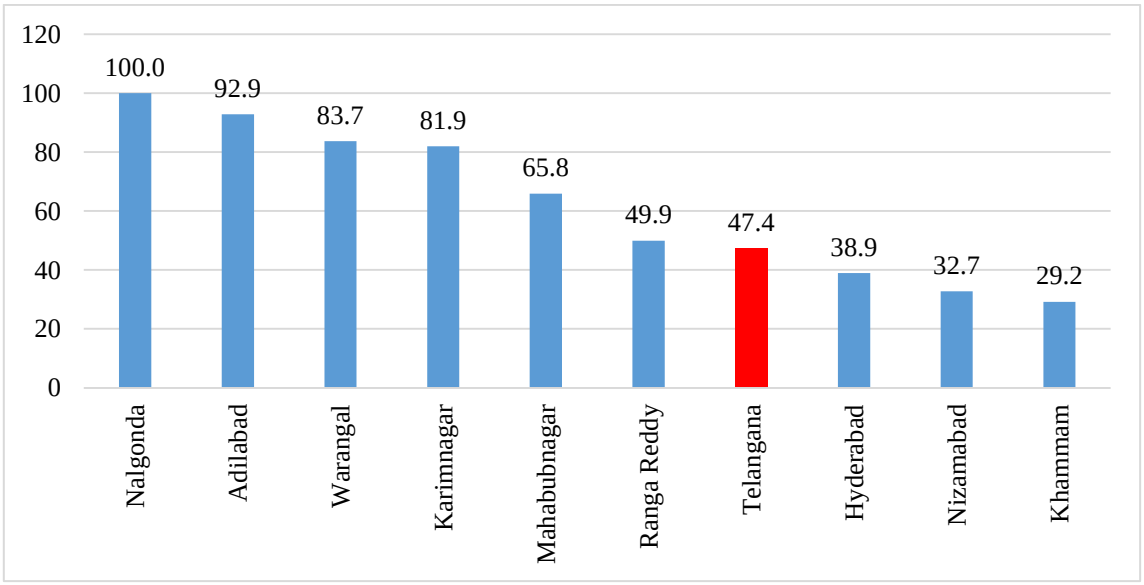
Among NACO supported blood banks, six districts recorded a higher percentage of voluntary donations which is above the state average of 81.3%. Medak and Nalgonda reported 100% voluntary blood donation, followed by Mahbubnagar (99.4), Adilabad (98.5), Khammam (89.8), and Karimnagar (84.9). Warangal, Hyderabad, Nizamabad and Ranga Reddy districts reported less than 80% of voluntary donation during January to December 2015.

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



Among Non-NACO blood banks, six districts recorded more than state average of 47.4%. Nalgonda district recorded 100% voluntary blood donation and Hyderabad(38.9), Nizamabad (32.7) and Khammam (29.2) recorded less than 40% voluntary blood donation among Non-NACO blood banks.

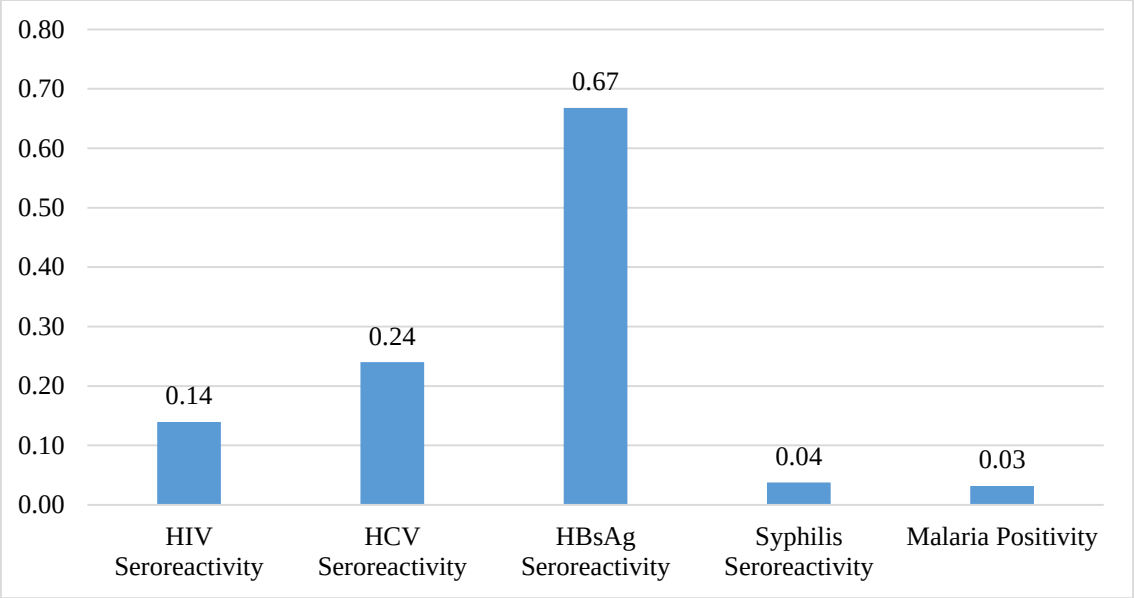
Figure 9 - Percentage of Voluntary Blood Donation by District (Non-NACO)



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 0.14%, Hepatitis-C was 0.24%, Hepatitis-B 0.67%, Syphilis 0.04% and Malaria 0.03%. However, there is a huge variation between districts.

HIV, HCV and Syphilis reactivity rates were recorded higher in NACO supported blood banks as compared to Non-NACO blood banks.

Table 8 - Transfusion Transmitted Infections (%)

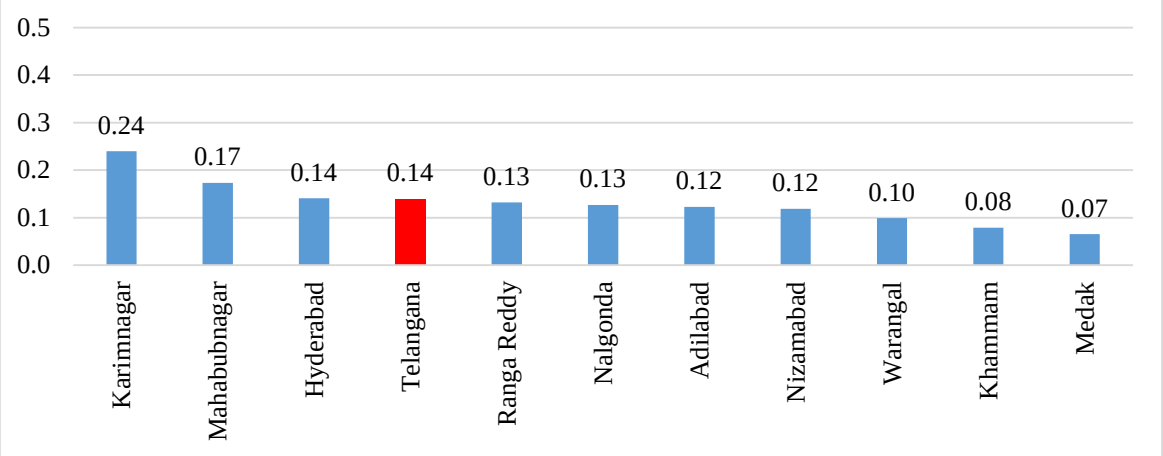
Category of BB	Transfusion Transmitted Infections %				
	HIV	HCV	HBV	Syphilis	Malaria
NACO Supported	0.16	0.32	0.78	0.07	0.05
Non-NACO	0.12	0.18	0.58	0.02	0.02
Overall	**0.14**	**0.24**	**0.67**	**0.04**	**0.03**

4.3.1 Transfusion Transmitted Infections by Category of blood banks: HIV, HIV and seroreactivity rates were slightly higher in blood banks with component facility. Malaria positivity was found to be significantly higher in blood banks without component facility.

Table 9 - Transfusion Transmitted Infections by category of blood banks

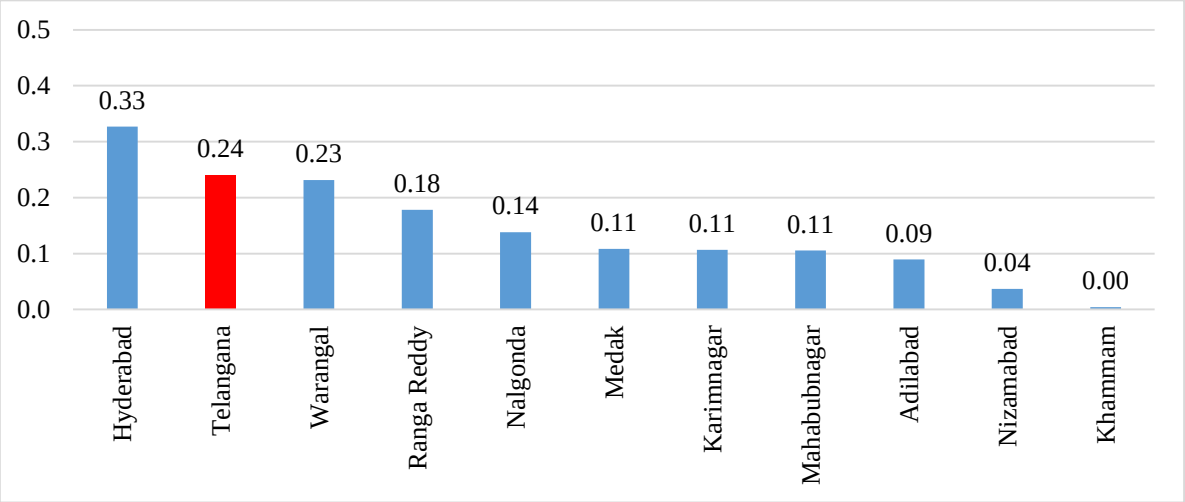
Category of BB	Transfusion Transmitted Infections %				
	HIV	HCV	HBV	Syphilis	Malaria
BBs with component facility	0.15	0.28	0.67	0.04	0.01
BBs without component facility	0.11	0.10	0.66	0.04	0.14
Overall	**0.14**	**0.24**	**0.67**	**0.04**	**0.03**

Figure 11 - HIV Seroreactivity- By District (%)



The majority of districts indicated lower HIV reactivity than the state HIV reactivity level of 0.14%. However, Karimnagar (0.24), Mahbubnagar (0.17) and Hyderabad (0.14) recorded a higher reactivity than state average. Districts such as, Khammam and Medak recorded less than 0.1% HIV reactivity.

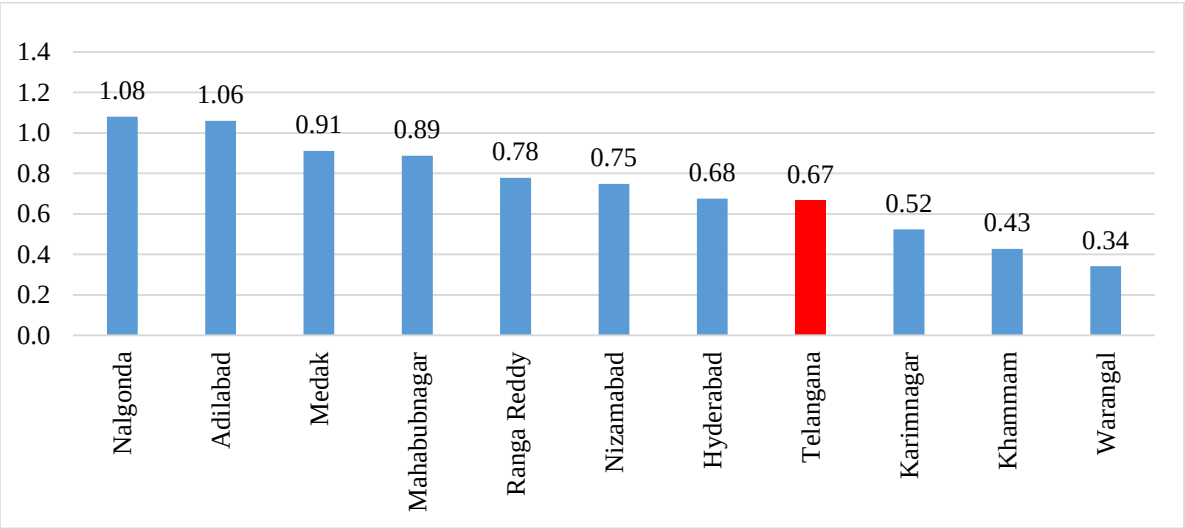
Figure 12 - HCV Seroreactivity- By District (%)



In terms of Hepatitis C infection, Hyderabad district reported the highest seroreactivity (0.33%) which is higher than the state average of 0.24%. All the other districts reported reactivity level lower than the state average. Khammam district reported only one case of HCV reactivity.

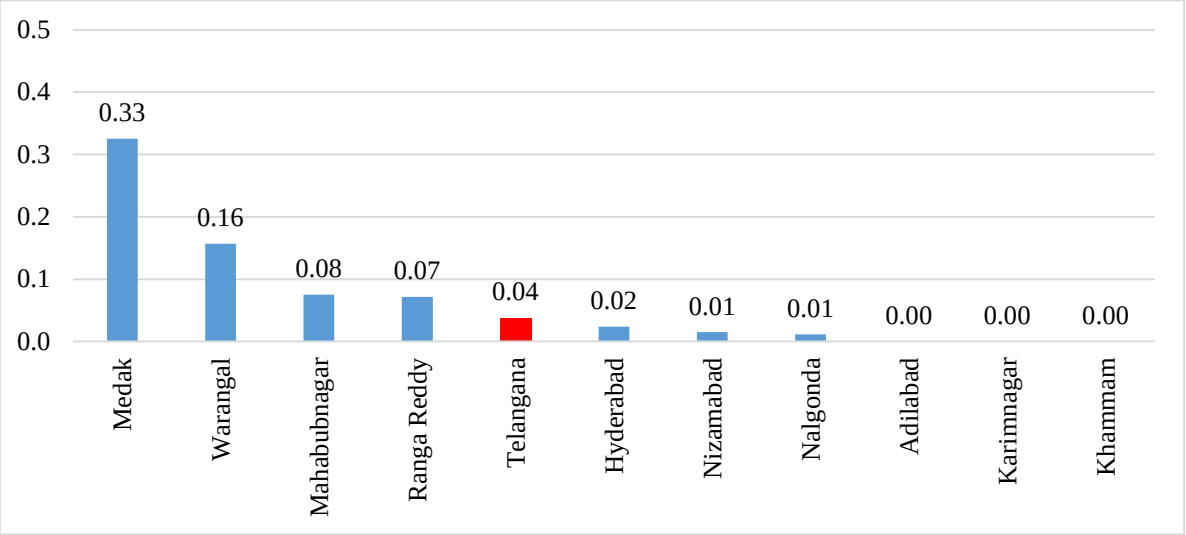
Hepatitis B seroreactivity was found to be higher than the state average of 0.67% in districts like Nalgonda (1.08), Adilabad (1.06), Medak (0.91), Mahbubnagar (0.89), Ranga Reddy (0.78), Nizamabad (0.75) and Hyderabad (0.68). Three districts recorded less than the state average.

Figure 13 - HBV Seroreactivity- By District (%)



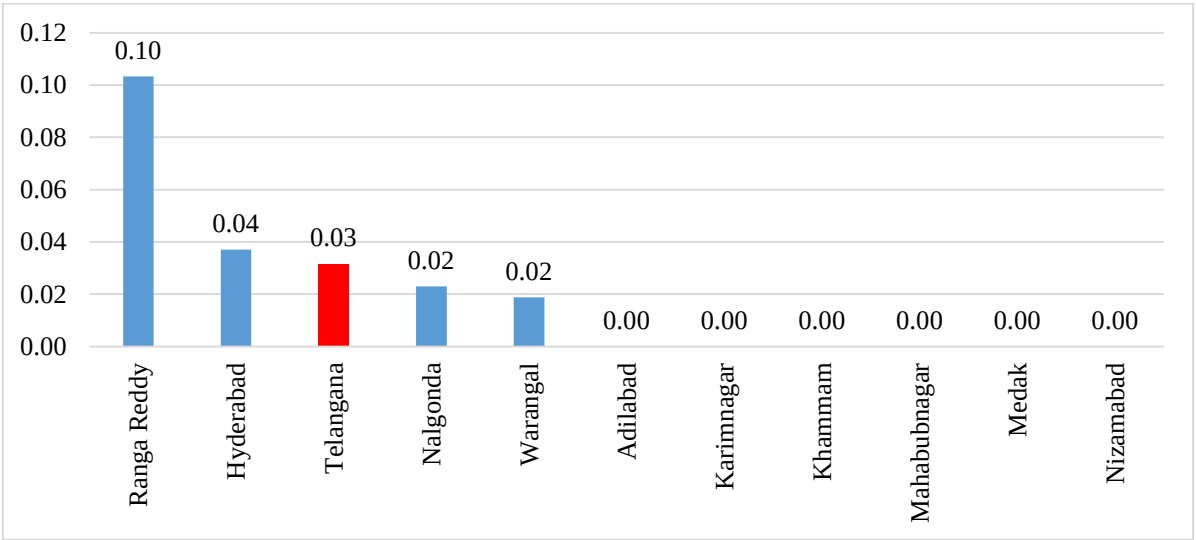
Syphilis seroreactivity was found to be the highest in Medak district (0.33%) followed by Warangal (0.16), Mahbubnagar (0.08) and Ranga Reddy (0.07). Adilabad, Karimnagar and Khammam district did not report any syphilis cases during January to December 2015.

Figure 14 - Syphilis Seroreactivity- By District (%)



The majority of the districts indicated a lower Malaria positivity than the state average of 0.03% whereas districts like Hyderabad and Ranga Reddy recorded a higher positivity than the state average.

Figure 15 - Malaria Positivity- By District (%)



4.4 Component Separation

As depicted in Figure -16, around 68.3% 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 (73.2%) in Non-NACO blood banks compared to NACO supported blood banks (61.8%).

Figure 16 - Total Collection by BCSUs and Component Separation

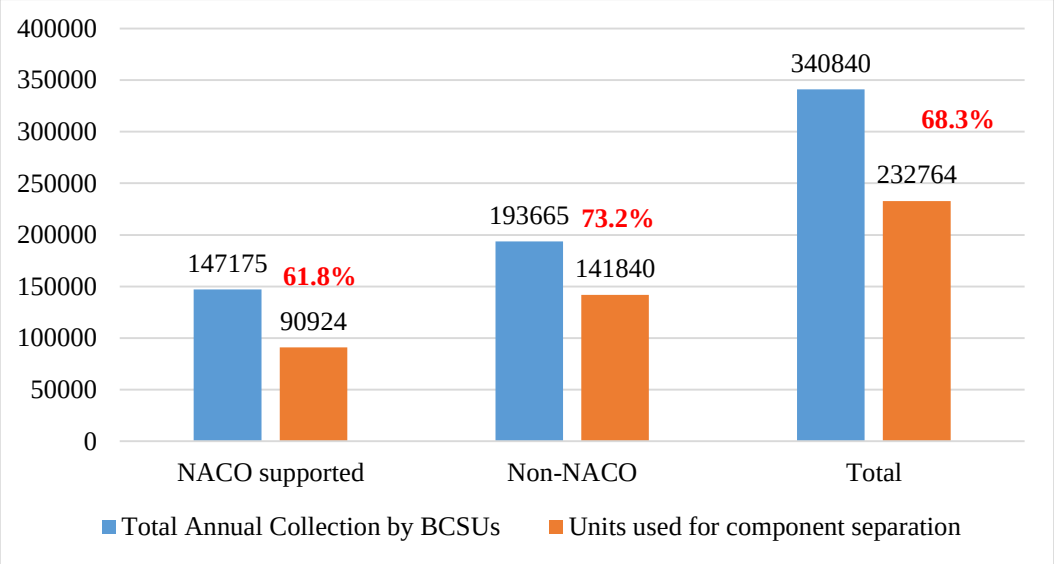
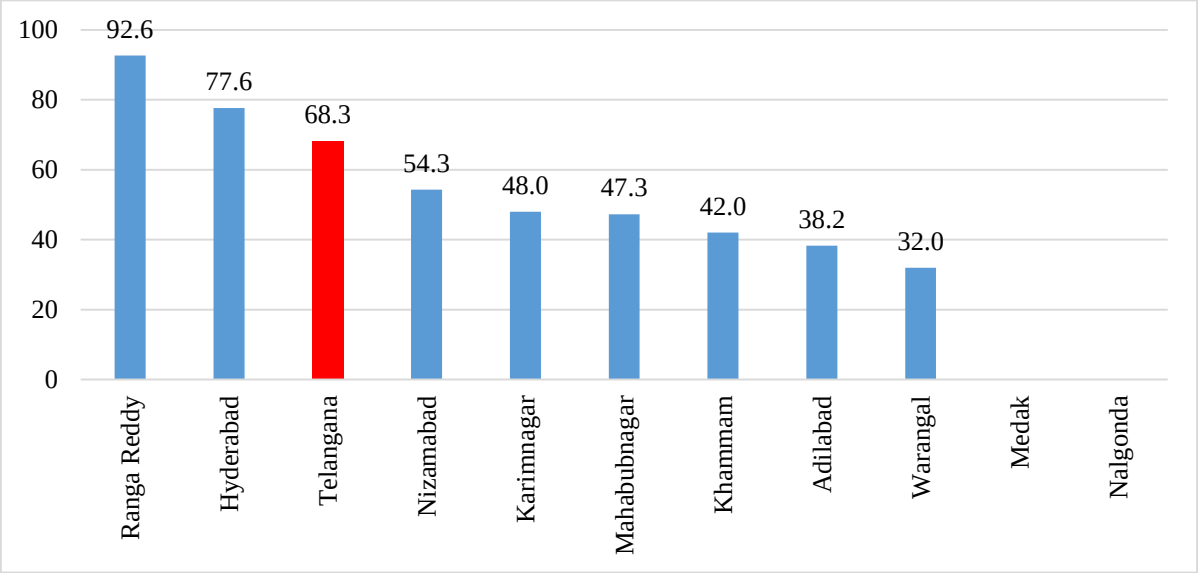


Table 10 - Total Annual Collection by BCSUs and Percentage of Component Separation

District	Total Annual Collection	Total Collection by BCSUs	Percentage of component separation
Adilabad	17576	15621	38.2
Hyderabad	245424	221215	77.6
Karimnagar	32118	23977	48.0
Khammam	22938	16055	42.0
Mahbubnagar	13808	1931	47.3
Medak	4610	0	-
Nalgonda	8697	0	-
Nizamabad	13382	6985	54.3
Ranga Reddy	34734	24037	92.6
Warangal	32077	31019	32.0
Telangana	**425,364**	**340,840**	**68.3**

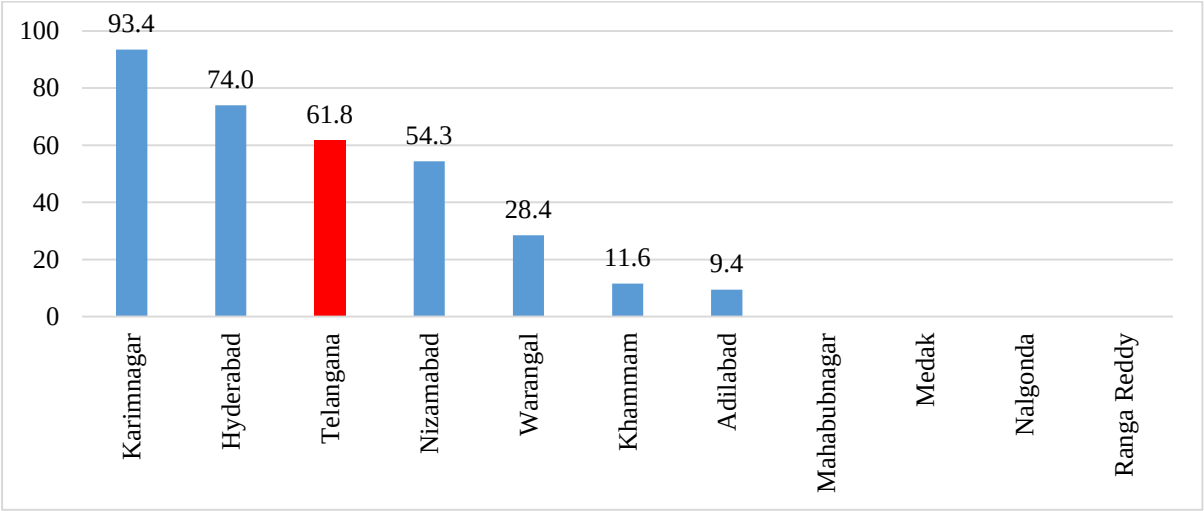
The percentage of component separation out of the total collection was more than 70% in Ranga Reddy and Hyderabad districts.

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 2 districts recording more than State average and 4 districts reporting less than 60% of component separation.

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



Districts such as Mahbubnagar, Medak, Nalgonda and Ranga Reddy 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 (87.8%) reported that they adhered to the NBTC guidelines. Availability of document control system was reported by around 56% of the blood banks in the state. Around 44% of NACO supported blood banks and 62.5% of Non-NACO blood banks reported they had a document control system. In terms of Standard Operating Procedures (SOPs) for technical processes, more than 95% reported that they had SOPs.

Table 11 - Availability of Quality Parameters in Blood Banks

Quality Parameters	NACO/NON-NACO		All Blood Banks (n=123)
	NACO supported (n=43)	Non-NACO (n=80)	
Compliance with NBTC guidelines	39	69	108
	90.7%	86.3%	87.8%
Availability of Documental Control System (DCS)	19	50	69
	44.2%	62.5%	56.1%
SOPs for Technical Processes	41	78	119
	95.3%	97.5%	96.7%
IQC for IH	29	71	100
	67.4%	88.8%	81.3%
IQC for TTI	23	40	63
	53.5%	50.0%	51.2%
QC for kits, reagents and blood bags	36	76	112
	83.7%	95.0%	91.1%
EQAS for IH	1	13	14
	2.3%	16.3%	11.4%

EQAS for TTI	1	10	11
	2.3%	12.5%	8.9%
NABH accreditation for blood banks	1	1	2
	2.3%	1.3%	1.6%
Availability of designated and trained Quality Manager	7	63	70
	16.3%	78.8%	56.9%
Availability of designated and trained Technical Manager	10	65	75
	23.3%	81.3%	61.0%
Programme for regular Equipment maintenance	38	73	111
	88.4%	91.3%	90.2%
Equipment calibration as per regulatory requirement	43	78	121
	100.0%	97.5%	98.4%

At the state level, Internal Quality Control (IQC) for Immunohematology was reported by 81.3% of the blood banks and IQC for TTIs was reported by 51.2% of the blood banks, with slight variation between NACO supported and Non-NACO blood banks. Around 91% 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 11.4% for immunohematology and 8.9% for TTIs. Only two blood banks out of the total 123 blood banks that participated in the assessment were accredited by National Accreditation Board for Hospitals & Healthcare Providers (NABH).

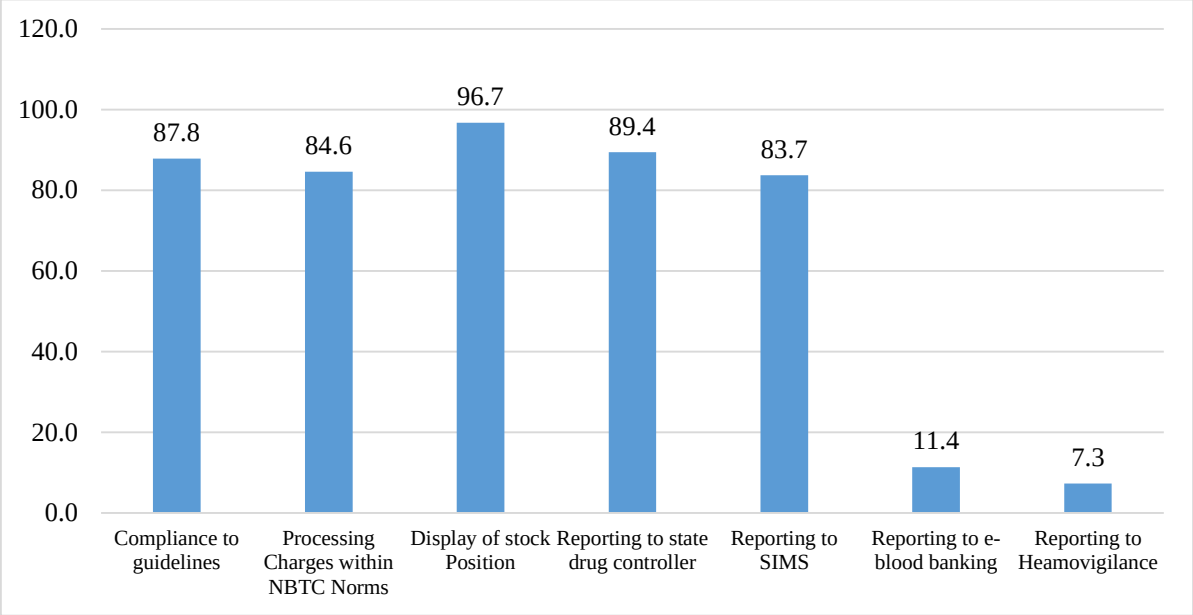
Designated and trained Quality Managers and Technical managers were available only in 56.9% and 61% of the blood banks respectively. More than 90% of blood banks reported that they had a regular equipment maintenance programme and around 98% reported that they calibrate the equipment as per requirement.

4.6. Reporting and Documentation

4.6.1. Compliance to NBTC guidelines

Majority of the blood banks (87.8%) reported to be compliant with NBTC guidelines. Around, 85% of Blood Banks reported that they were recovering processing charges within NBTC/SBTC norms. Most of the blood banks (97%) reported that they were displaying stock position in their Blood bank premises.

Figure 19 - Reporting and Documentation



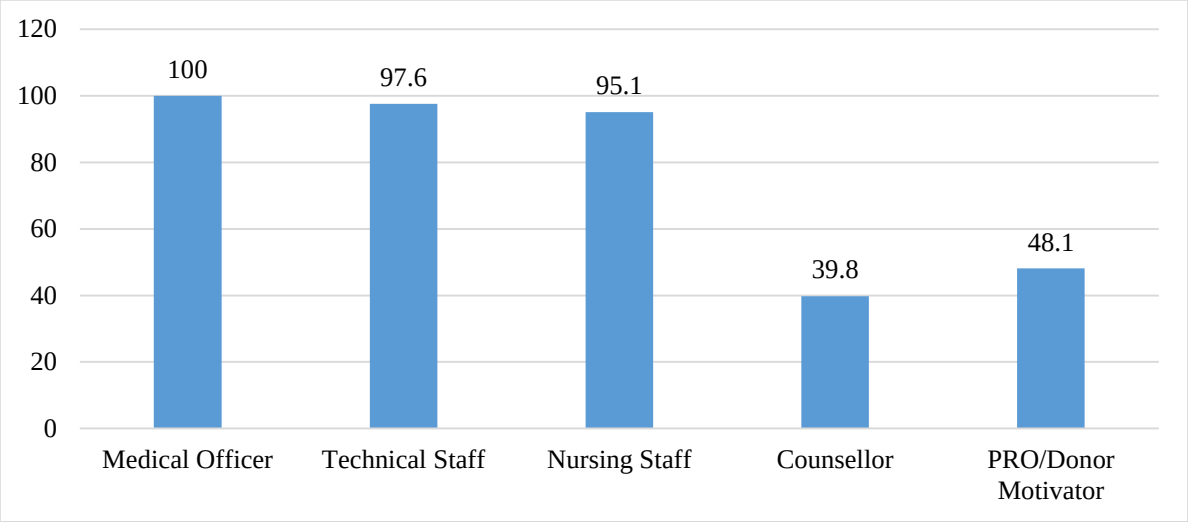
Reporting requirements: In terms of reporting requirement, 90% of blood banks submitted regular reports to state drug controller, around 84% of blood banks regularly reported in national strategic information management systems (SIMS). However, only 57.6 % regularly reported in E-blood banking either national or state e-blood banking. Only 7.3% of blood banks were members of National Haemovigilance Program.

4.7. Human Resources

4.7.1. Availability of staff

The mean number of employees in the blood bank was 12 (SD 6.2). It ranges from three employees to 35 employees. All blood banks have at least a Medical Officer. However, only around 40% of blood banks had counsellors and 48% had PRO/Donor motivators.

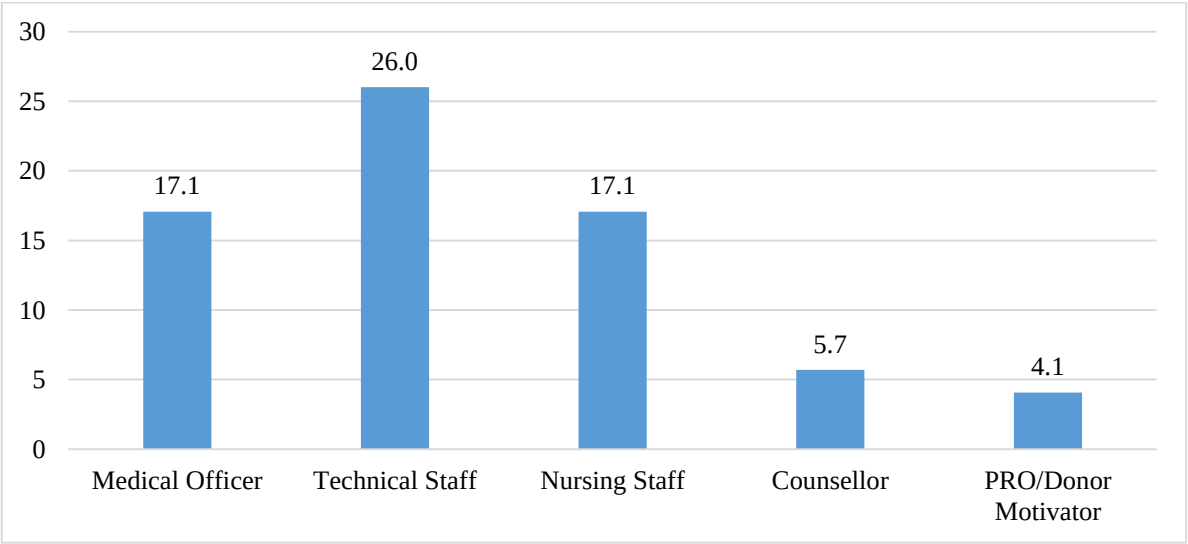
Figure 20 - Percentage of BB Manpower (At least one)



4.8. Training of Blood Bank Personnel

As per the study, 17% of blood banks had at least one Medical Officer trained by NACO/NBTC training, followed by 26% had at least one NACO/NBTC trained technical officer. 17% had nursing staff, 5.7% had counsellor and 4.1% had at least one PRO/Donor motivator trained by NACO/NBTC.

Figure 21 - Percentage of At least one trained

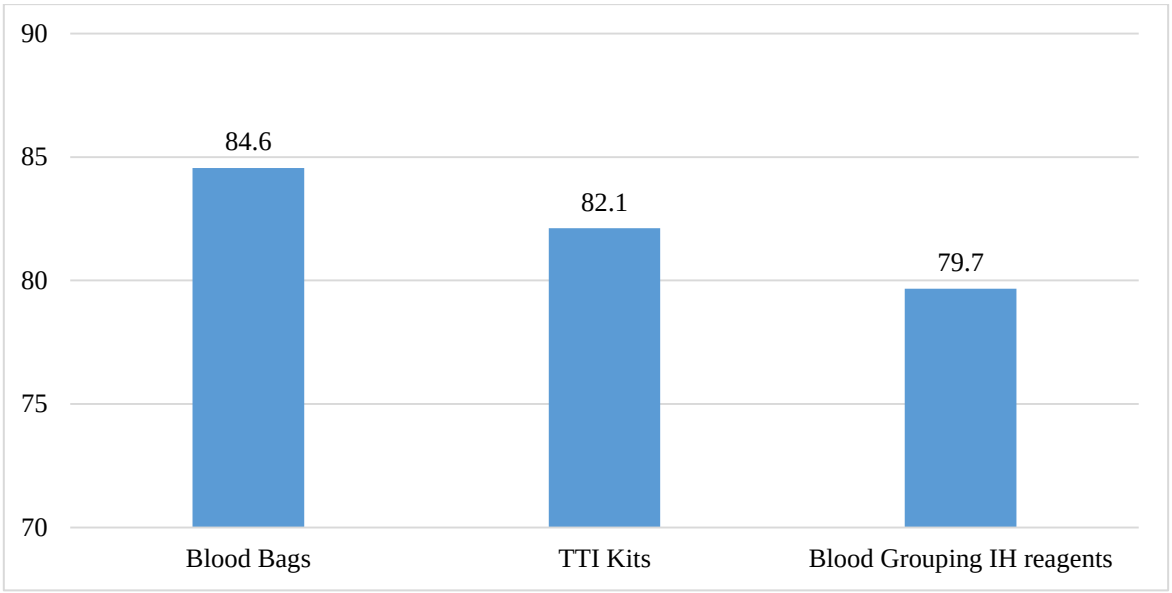


4.9. Equipment and Supplies

4.9.1. Regular supply kits/supplies

Majority of blood banks (84.6%) reported that they had regular supply of blood bags, 82.1% reported that they had regular supply of kits and 79.7% reported to have regular supply of blood grouping reagents.

Figure 22 - Regular Supply of Kits



4.9.2. Equipment Availability (working condition)

Table 12 indicates the availability of different equipment in working condition blood banks.

Table 12 - BBs having Equipment in working condition

BBs having at least one equipment in working Condition		
S No	**Equipment**	**% BB**
1	Donor Couches	100.0
2	Instrument for Hb Estimation	92.7
3	Blood collection monitor	99.2
4	Quarantine Blood Bank Refrigerator to store untested blood	98.4
5	Container for safe disposal of sharps	93.5
6	Oxygen supply equipment	99.2
7	Computers with accessories and software	83.7
8	General lab centrifuge for samples	91.9
9	Bench top centrifuge for serological testing (Immunohaematology)	81.3
10	Blood transportation box (No. in inventory)	94.3
11	Emergency drugs box / Crash cart	92.7
12	Autoclave machine	96.7
13	Water bath	95.9
14	Blood bank refrigerator (storage of tested blood) with temperature recorder	91.1
15	Automated pipettes	91.1
16	Refrigerated centrifuge	62.6
17	Blood container weighting device	82.9
18	Serology rotator	91.1

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

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

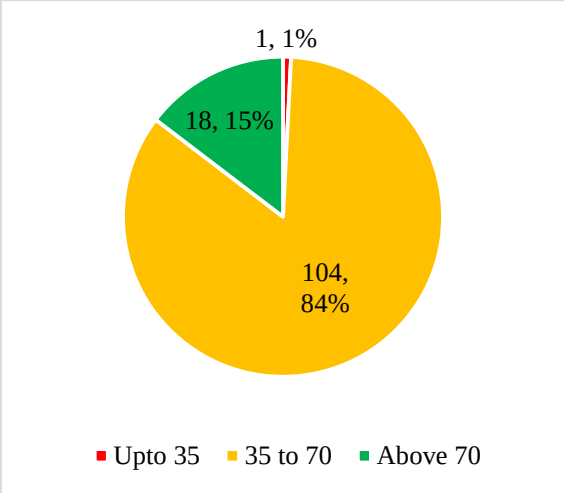
The mean assessment score of blood banks in the state was 62.11 (SD: 9.33). No significant difference was found between Non-NACO blood banks (62.11; SD: 9.65) and NACO supported blood banks (62.09; SD: 8.82).

Table 13 - Mean Assessment score

Type of BB	N	Mean	SD
NACO supported	43	62.09	8.82
Non-NACO	80	62.11	9.65
Total	**123**	**62.11**	**9.33**

At the state level, the majority of blood banks (104; 84%) scored between 35 to 70, followed by 18 (15%) blood banks which scored above 70, and only one blood bank scored less than or equal to 35.

Figure 23 - Categorisation of Blood banks (n=123)



Around 86% of NACO supported and 84% Non-NACO blood banks scored between 35 and 70. Around, 14% of NACO supported blood banks and 15% of Non-NACO blood banks scored more than 70%. (Refer Figure 25; Figure 26). One Non-NACO blood bank scored less than 35.

Figure 24 - Categorisation of NACO Supported BBs (n=43)

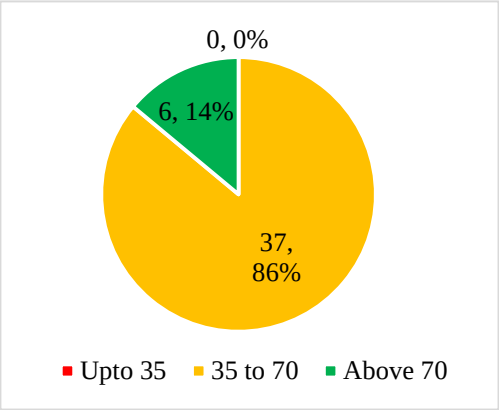
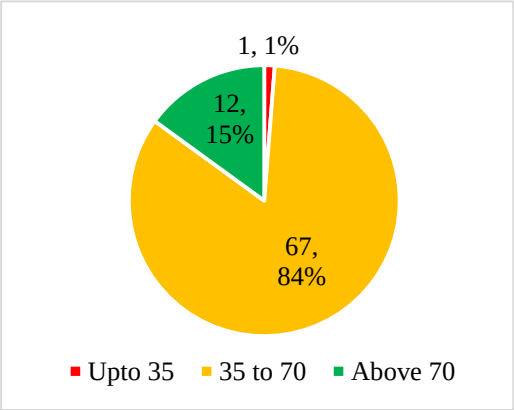
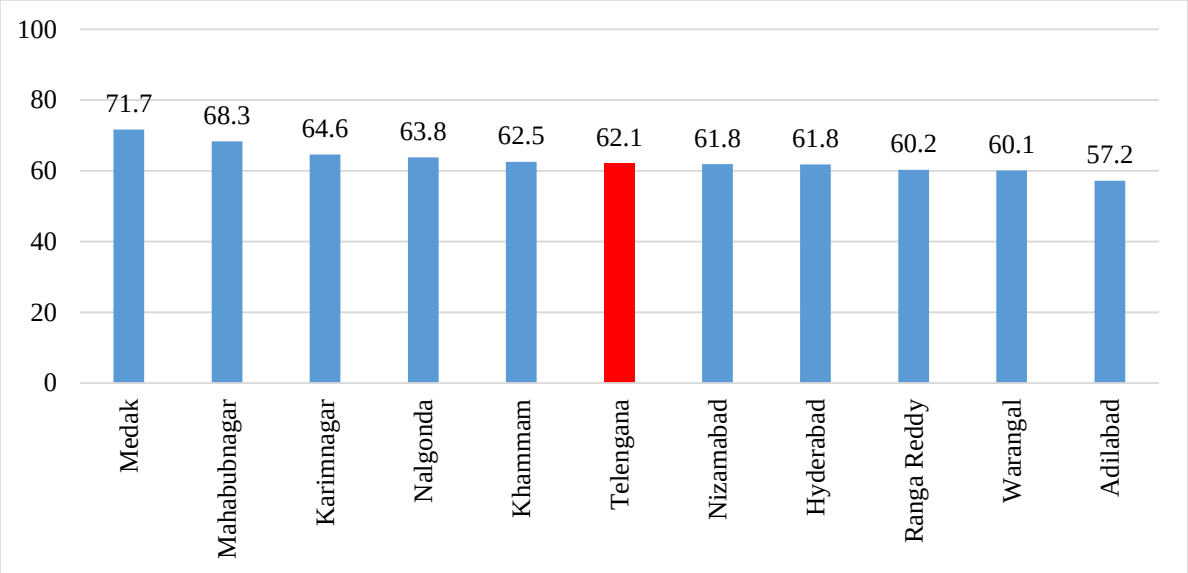


Figure 25 - Categorisation of Non-NACO BBs (n=80)



Among the districts, Medak (71.7) scored the highest and Adilabad (57.2) scored the least. Five districts scored above the state average and five district scored below the state average of 62.1.

Figure 26 - Mean Assessment Score – By Districts (All BBs)



Though the difference in the mean score at the state level between NACO and Non-NACO blood banks was very low, the mean scores of Non-NACO supported blood banks were higher than the NACO supported blood banks in 7 districts out of the 10 districts in the state. The difference in the score was more than 5 in Non-NACO blood banks in two districts. The mean score of NACO supported blood banks in Warangal and Khammam was higher than Non-NACO blood banks.

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

District	NACO supported	Non-NACO	Total
Adilabad	52.17	64.75	57.20
Hyderabad	60.23	62.41	61.82
Karimnagar	60.88	67.60	64.61
Khammam	64.75	61.00	62.50
Mahbubnagar	68.25	68.50	68.30
Medak	71.67	-	71.67
Nalgonda	63.33	65.00	63.75
Nizamabad	60.00	63.67	61.83
Ranga Reddy	57.00	60.38	60.19
Warangal	64.17	57.60	60.06
Telengana	**62.09**	**62.11**	**62.11**

There was one Non-NACO blood bank from Ranga Reddy district scored less than or equal to 35. The number of blood banks that scored more than 70 is mentioned in Table-15. Of the 18 blood banks that scored more than 70 score, 12 (66.6%) were Non-NACO blood banks. The majority of blood banks that scored above 70 were from Hyderabad (8) followed by Ranga Reddy (3), Karimnagar (2), Mahbubnagar (2) and Medak (2).

Table 15 - Number of Blood Banks Scored above 70- by District

District	NACO	Non - NACO	Total
Adilabad	-	1	1
Hyderabad	2	6	8
Karimnagar	-	2	2
Khammam	-	-	-
Mahbubnagar	2	-	2
Medak	2	-	2
Ranga Reddy	-	3	3
Telangana	**6**	**12**	**18**

4.10.1 Assessment score by Category of blood banks: The mean score of blood banks with component facilities (62.60; SD: 9.86) was found to be higher than the mean score of those without component facilities (61.49; SD: 8.693).

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	16	60.94	9.00	52	63.12	10.13	68	62.60	9.86
Without BCSU	27	62.78	8.81	28	60.25	8.55	55	61.49	8.69

The blood bank that scored <=35 was having component separation facility. (Refer figure 27 and 28). Around 18% of blood banks with component preparation facility scored more than 70, as compared to 21% of blood banks without component facility.

Figure 27- BBs with Component-Score (n=68)

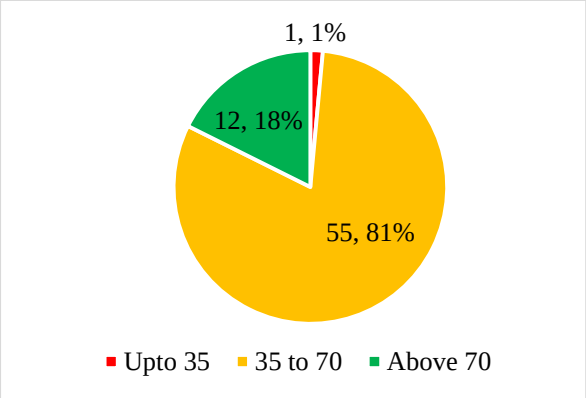
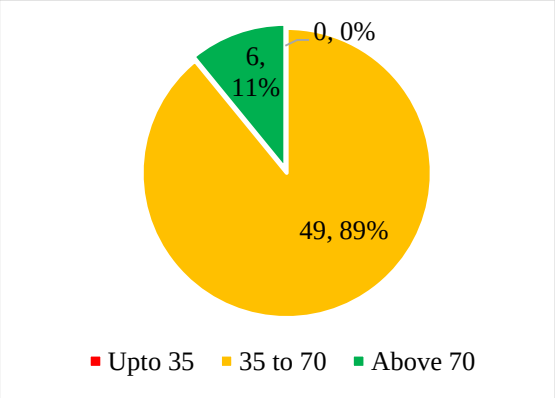


Figure 28- BBs without Component-Score (n=55)



4.10.2 Assessment score by Ownership: The mean assessment score of private owned blood banks (63.21; SD: 11.79) was found to be higher than not-for-profit (NGO/Trust/Charitable) sector blood banks (62.37; SD: 6.37) and public sector blood banks (59.83 SD: 9.77). However, NACO supported blood banks run by not-for-profit sector had scored higher (64.69; SD: 6.40) compared to Non-NACO NGO/Trust/Charitable blood banks (61.17; SD: 6.11).

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	18	64.69	6.40	35	61.17	6.11	53	62.37	6.37
Private	-	-	-	43	63.21	11.79	43	63.21	11.79
Public	25	60.22	9.92	2	55.00	8.49	27	59.83	9.77

Table 18 - Mean assessment scores categories by Ownership

Ownership	<=35	36 to 70	Above 70	Total
Public	-	23	4	27
	-	85.2%	14.8%	100%
NGO/Trust/Charitable	-	50	3	53
	-	94.3%	5.7%	100%
Private	1	31	11	43
	2.3%	72.1%	25.6%	100%
Overall	**1**	**104**	**18**	**123**
	0.8	**84.6**	**14.6**	**100**

4.10.3 Assessment score of Private Sector Blood Banks: Irrespective of the NACO support status, 78% (96) blood banks were owned by private sector, of which, 53 (55.2%) were owned by not-for-profit sector such as, NGO, Trust, and charitable organizations. The mean score of private sector owned blood banks including not-for-profit sector was 62.7 (SD: 9.1) the mean score of public owned blood banks was 59.8 (SD: 9.7). Among the private sector, not-for-profit sector (64.7.96; SD: 6.4) scored slightly higher than the other private blood banks (63.2; SD: 11.8).

Nevertheless, it is also important to note that the average annual collection was higher (340,908 units) in private owned blood banks compared to public blood banks (84,456 Units). However, the percentage of voluntary blood donation was higher in public owned blood banks (68.4%) compared to the public blood banks (61%).

4.10.4 Assessment score by Annual Collection: The mean assessment score of blood banks that collected more than 5000 blood units (64.60; SD: 9.20) was found to be higher than those which collected between 3001 and 5000 (63.32; SD: 5.91) and less than 3000 blood units (62.14; SD: 8.02).

Table 19 - Mean assessment score by annual collection

Annual Collection	NACO supported		Non-NACO		Total	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Up to 3000	63.27	8.11	61.58	8.01	62.14	8.02
3001 to 5000	60.88	7.04	64.47	5.12	63.32	5.91
Above 5000	62.58	9.55	66.32	8.88	64.60	9.20

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 voluntary blood donation. The mean assessment score of blood banks that collected more than 90% voluntary blood donation was 64.53 (SD: 8.29) which is relatively higher than the other groups.

Table 20 - Mean assessment score by voluntary blood donation

% VBD	NACO supported		Non-NACO		Total	
	Mean	SD	Mean	SD	Mean	SD
Less than 25	50.67	4.16	63.84	9.75	62.56	10.12
25 to 49	-	-	58.95	5.44	58.95	5.44
50 to 74	63.42	3.69	63.33	6.18	63.36	5.36
75 to 90	60.71	7.63	63.31	4.73	62.40	5.84
Above 90	64.33	8.44	65.00	8.29	64.53	8.29

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 (71.36; SD: 7.25) as compared to those who were not enrolled (60.92; SD: 8.92). Similar situation was found among those blood banks that were part of EQAS for Transfusion-Transmitted Infections (73.50; SD: 6.10) as compared to those who were not enrolled (60.99; SD: 8.85). More number of Non-NACO blood banks were enrolled in 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	1	84.00	-	13	70.38	6.53	14	71.36	7.25
NO	42	61.57	8.23	67	60.51	9.36	109	60.92	8.92
TTI-EQAS									
YES	1	84.00	-	10	72.45	5.28	11	73.50	6.10
NO	42	61.57	8.23	70	60.64	9.24	112	60.99	8.85

4.10.7 Assessment score by Accreditation status: The mean score was found to be higher among blood banks that were accredited by National Accreditation Board of Hospitals and Health care Providers (NABH) in comparison to those that were not accredited. NACO supported blood banks accredited by NABH scored higher than Non-NACO NABH accredited blood banks.

Table 22 - Mean assessment score by Accreditation

NABH Accreditation	NACO supported			Non-NACO			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
YES	1	84.00	-	1	73.50	-	2	78.75	7.42
NO	42	61.57	8.23	79	61.97	9.63	121	61.83	9.13

Only two out of the 123 blood banks have been accredited by NABH.

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	**Upto 35**	**35 to70**	**Above 70**	**Total**
Adilabad	-	4	1	5
Hyderabad	-	47	8	55
Karimnagar	-	7	2	9
Khammam	-	10	-	10
Mahbubnagar	-	3	2	5
Medak	-	1	2	3
Nalgonda	-	4	-	4
Nizamabad	-	6	-	6
Ranga Reddy	1	14	3	18
Warangal	-	8	-	8
Telangana	**1**	**104**	**18**	**123**

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**
Adilabad	-	3	-	-	1	1
Hyderabad	-	13	2	-	34	6
Karimnagar	-	4	-	-	3	2
Khammam	-	4	-	-	6	-
Mahabubnagar	-	2	2	-	1	-
Medak	-	1	2	-	-	-
Nalgonda	-	3	-	-	1	-
Nizamabad	-	3	-	-	3	-
Ranga Reddy	-	1	-	1	13	3
Warangal	-	3	-	-	5	-
Telangana	**-**	**37**	**6**	**1**	**67**	**12**

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 Telengana 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 43 NACO and 80 Non-NACO blood banks which were included in the review are approximately 83% of the total blood banks existing in the state. The annual collection of these blood banks was 425,364 units which is approximately 120% 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 1.2 units to 17.2 units per 100 population. Clinical demand for blood and blood products can happen only when there is a health care facility with adequate infrastructure in proximity to a blood bank. The relatively lower collection of blood in the few districts could be due to the fact that there is lower demand for blood because of the gaps in availability, accessibility, and affordability of health care services.

The review also revealed that the majority of blood collection (80%) was by blood banks with the component facility compared to smaller blood banks without component facility. The percentage of voluntary blood donation in 2015 was 62.5% which is very low comparing to the country and other states. Moreover, there is a huge variation between districts that ranges from 49% to 100%. A targeted program to increase the non-remunerated voluntary blood donors will go a long way towards ensuring a safer option for our patients.

It is also evident that the distribution of blood banks is skewed with 75% of the all the blood banks in the state relegated to only 4 districts. Seven out of the 10 districts have less than the state average of 4.3 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.

Almost one fourth (28%) 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 62.11 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.

6. Reference

CDSCO. (2015). LIST OF LICENSED BLOOD BANKS IN INDIA * (February, 2015). Retrieved from http://www.cdsco.nic.in/writereaddata/BLOOD%20BANKS%20INDIAfeb2015.pdf

Chandra, T., Rizvi, S. N. F., & Agarwal, D. (2014). Decreasing Prevalence of Transfusion Transmitted Infection in Indian Scenario. *The Scientific World Journal, 2014*, 4. doi:10.1155/2014/173939

GOI. (2003). *Transfusion Medicine, Technical Manual*. New Delhi: Director General of Health Services, Government of India.

Gupta, R., Singh, B., Singh, D. K., & Chugh, M. (2011). Prevalence and trends of transfusion transmitted infections in a regional blood transfusion centre. *Asian J Transfus Sci, 5*(2), 177-178. doi:10.4103/0973-6247.83250

ISO-8402. (1994). *Quality Management and Quality Assurance - Vocabulary*. Retrieved from Geneva, Switzerland.:

NACO. (2007a). *National Blood Policy (India)*. Retrieved from New Delhi: http://upsacs.nic.in/bs%20doc/bs%20National%20Blood%20Policy.pdf

NACO. (2007b). *Standards For Blood Banks & Blood Transfusion Services*. Retrieved from New Delhi: http://www.iapsmgc.org/userfiles/10_Standards_for_Blood_Banks_and_Blood_Transfusion_Services.pdf

NACO. (2014). *National AIDS Control Programme Phase-IV (2012-2017) Strategy Document*. Retrieved from New Delhi: http://www.naco.gov.in/upload/NACP%20-%20IV/NACP-IV%20Strategy%20Document%20.pdf.

NACO. (2016). *Annual Report 2015-16*. Retrieved from New Delhi:

Pal, R., Kar, S., Zaman, F. A., & Pal, S. (2011). The quest for an Indian blood law as of blood transfusion services regulatory framework. *Asian J Transfus Sci, 5*(2), 171-174. doi:10.4103/0973-6247.83246

Ramani, K. V., Mavalankar, D., & Govil, D. (2007). *Management of Blood Transfusion Services in India: An Illustrative Study of Maharashtra and Gujarat States*. Retrieved from

Schlickman, J. J. (1998). *ISO 9000 quality management system design: optimal design rules for documentation, implementation, and system effectiveness*: ASQ Quality Press.

WHO. (1975). *World Health Assembly resolution WHA28.72. Utilization and supply of human blood and blood products*. Retrieved from http://www.who.int/entity/bloodsafety/en/WHA28.72.pdf

WHO. (2008). *Universal Access to Safe Blood Transfusion*. Retrieved from Geneva:

WHO. (2009). *GDBS Summary Report 2009*. Retrieved from Geneva: http://www.who.int/bloodsafety/global_database/GDBS_Summary_Report_2009.pdf

WHO. (2011). *Developing a National Blood System*. Retrieved from Geneva: http://www.who.int/entity/bloodsafety/publications/am_developing_a_national_blood_system.pdf?ua=1

WHO. (2012). More voluntary blood donations essential [Press release]. Retrieved from http://www.who.int/mediacentre/news/releases/2012/blood_donation_20120614/en/

WHO. (2016a). Quality systems for blood safety. Retrieved from http://www.who.int/bloodsafety/quality/en/

WHO. (2016b). World Blood Donor Day 2016: Blood connects us all. Retrieved from http://www.who.int/campaigns/world-blood-donor-day/2016/en/

7. Annexures

7.1 Individual Blood Banks' Summary

District	Name	Type	Ownership	Annual Collection	Score (Out of 100)
Adilabad	Rajiv Gandhi Institute Of Medical Sciences Blood Bank	BCSU	Public	8363	47.5
	Indian Red Cross Society Blood Bank	BCSU	Private	7258	72.5
	IRCS Rch 2 Project Blood Bank Nirmal,Area Hospital	Non BCSU	Public	1499	47
	Singareni Colories Co.Ltd, Area Hospital Blood Bank	Non BCSU	NGO/Charitable /Trusts	362	62
	Sri Lakshmi Blood Bank	Non BCSU	Private	94	57
Hyderabad	Thalassemia & Sickle Cell Society Vuppala Venkaiah Memorial Blood Bank	BCSU	NGO/Charitable /Trusts	18539	68
	Nizam's Institute Of Medical sciences	BCSU	Public	16194	54
	Indian Red Cross Society Blood Bank	BCSU	NGO/Charitable /Trusts	14880	59
	NTR Trust Blood Bank	BCSU	NGO/Charitable /Trusts	12599	84
	Krishna Institute Of Medical Sciences Blood Bank	BCSU	Private	12191	67
	Chiranjeevi Eye & Blood Bank	BCSU	NGO/Charitable /Trusts	11784	64
	Gandhi Hospital Blood Bank	BCSU	Public	10384	50
	Apollo Blood Bank Centre	BCSU	Private	9586	78.5
	Star Hospital Blood Bank	Non BCSU	Private	8154	82
	Basavatarakam Indo-American Cancer Hospital And Research Institute Blood Bank	BCSU	Private	7218	62.5
	Sanjeevini Blood Bank	BCSU	Private	7190	61.5

	Aarohi Blood Bank	BCSU	NGO/Charitable /Trusts	6577	63.5
	Mythri Charitable Trust Blood Bank	BCSU	Private	6461	61.5
	Sun Shine Hospital Blood Bank	BCSU	Private	6356	72.5
	St Theresa's Hospital Blood Bank	BCSU	Private	6301	61.5
	Yashoda Hospital Blood Bank	BCSU	Private	5669	70.5
	Sri Balaji Blood Bank	BCSU	Private	5511	49.5
	Quality Care-A.K Diagnostics Ltd	BCSU	Private	5207	72.5
	Princess Esra Hospital Blood Bank	Non BCSU	Private	4785	68
	Osmania General Hospital Blood Bank	BCSU	Public	4615	52
	Durbai Deshmukh Hospital & Rc Blood Bank	BCSU	Private	4469	55
	Yashoda Hospital Blood bank	BCSU	Private	4284	68
	ADRM Hospital Blood Bank	BCSU	Private	4243	56
	Institute of Preventive Medicine	BCSU	Public	4175	53
	Yashoda Hospital Blood Bank	BCSU	Private	3986	70
	CARE Hospital Blood Bank	BCSU	Private	3907	62
	Himabindu Multi Speciality Hospital Blood Bank	BCSU	Private	3697	61
	Genetic Products Charitable Association Blood Bank	BCSU	Private	3009	60
	Janani Voluntary Blood Bank	BCSU	Private	2875	60
	Asian Institute Of Gastroenterology, Blood Bank	BCSU	Private	2784	62
	Global Hospital Blood Bank	BCSU	Private	2524	73
	Share Medi Cal Care (Medicity Blood Bank)	BCSU	Private	2433	68
	Sathya Nursing Home Blood Bank	BCSU	Private	2309	55
	New Life Hospital	BCSU	Private	2107	55

	Blood Bank				
	Sri Devi Charitable Trust Blood Bank	BCSU	Private	2100	61
	Health, Agriculture, Rural Development (HARD),Blood Bank	BCSU	Private	2068	59
	MGMH Blood Bank,Model Govt Maternity Hospital	Non BCSU	Public	2051	52
	Rudira Voluntary Blood Bank	BCSU	Private	1798	65.5
	Prime Hospital Blood Bank	Non BCSU	Private	1707	65
	Niloufer Hospital For Women And Children	Non BCSU	Public	1303	63
	Sai Vani Super Speciality Hospital Blood Bank	BCSU	Private	1185	51.5
	Premier Hospital Blood Bank	Non BCSU	Private	1111	58
	Apollo DRDO Hospital Blood Bank	Non BCSU	Private	934	53
	Kamineni Health Services Pvt Ltd Blood Bank	Non BCSU	Private	832	66
	Blood Bank, MNJ Institute of Oncology & Regional Cancer Centre	Non BCSU	Public	826	75
	Lion Club Of Hyderabad East Bhanji Kheraj Blood Bank	Non BCSU	NGO/Charitable /Trusts	756	61
	Vivekananda Environmental Inter National Society Blood Bank	Non BCSU	Private	490	60
	Medwin Hospital Blood Bank	Non BCSU	Private	481	63
	Central Hospital Lallaguda	Non BCSU	Public	360	61
	Mahavir Hospital & Research Centre Blood Bank	Non BCSU	Private	162	65
	Apollo Hospital Blood Bank	Non BCSU	Private	160	42
	APSRTC Hospital Blood Bank	Non BCSU	Public	97	65
	AIMSR-GH Blood Bank	BCSU	Private	-	56

	Blood Bank, Govt Maternity Hospital	Non BCSU	Public	-	40
	Social Service Blood Bank	Non BCSU	Private	-	58
Karimnagar	Lifecare Voluntary Blood Bank	BCSU	Private	8546	58.5
	Government District Headquaters Hospital Blood Bank	BCSU	Public	6084	67.5
	Blood Bank of Prathima Institute of Medical Science	BCSU	Private	3969	73
	Blood Bank of Chalmeda Anand Rao Institute of Medical Sciences	BCSU	Private	3452	65
	Indian Red Cross Society Blood Bank	Non BCSU	NGO/Charitable /Trusts	3032	62
	Indian Red Cross Society Blood Bank (Rch-Ii)	Non BCSU	NGO/Charitable /Trusts	2780	68
	Nelavelly Blood Bank	Non BCSU	Private	2006	69
	Apollo Reach Hospitals, Apollo Blood Bank	BCSU	Private	1926	72.5
	Singareni Colleries Company Limited	Non BCSU	Public	323	46
Khammam	Siva Multi Speciality Hospital Blood Bank	BCSU	Private	10631	58
	APVVP District Headquarters Hospital Blood Bank	BCSU	Public	3329	61
	Area Hospital Blood Bank Bhadrachalam	Non BCSU	Public	2235	69
	M/s. Mamata General Hospital Blood Bank	BCSU	Private	2070	70
	Asha Blood Bank	Non BCSU	Private	1934	57
	Govt. Area Hospital	Non BCSU	Public	1172	63
	Sarala Blood Bank	Non BCSU	Private	796	63
	M/s. Singareni Collieries Co. Ltd	Non BCSU	Public	746	66
	Rudhira Voluntary Bb	BCSU	Private	25	59
	Lotus Super Speciality Hosptial Blood Bank	Non BCSU	Private	-	59

Mahabubnagar	Indian Red Cross Society Blood Bank	Non BCSU	NGO/Charitable /Trusts	8486	63
	SVS Medical College Hospital Blood Bank	BCSU	Private	1931	68.5
	Govt District Headquarters Hospital Blood Bank	Non BCSU	Public	1239	73
	Indian Red Cross Society Blood Bank Wanaparthy	Non BCSU	Public	1212	74
	M/s Indian Red Cross Society Blood Bank,Mahbubnagar	Non BCSU	NGO/Charitable /Trusts	940	63
Medak	TVVP District Headquarters Hosptial Blood Bank Sangareddy.	Non BCSU	Public	3230	73
	IRCS RCH 2 ,Medak	Non BCSU	NGO/Charitable /Trusts	1259	75
	BHEL General Hospital, Blood Bank	Non BCSU	Public	121	67
Nalgonda	Indian Red Cross Society, Nalgonda	Non BCSU	NGO/Charitable /Trusts	3606	65
	IRCS RCH-II Blood Bank,Nalgonda	Non BCSU	NGO/Charitable /Trusts	2290	57
	Jyothi Hospital Blood Bank	Non BCSU	Private	1511	65
	District hospital Nalgonda Blood Bank	Non BCSU	Public	1290	68
Nizamabad	Indian Red Cross Society Blood Bank, for operation Blood Bank,Nizamabad	BCSU	NGO/Charitable /Trusts	3945	65
	Perali Narsaiah Memorial Charitable Trust Blood Bank	Non BCSU	Private	3332	65
	Government Blood Bank, Govt. General Hospital, Nizamabad	BCSU	Public	3040	56
	S.B.Voluntary Blood Bank	Non BCSU	Private	1408	58
	VT.Thakur Memorial Roarty Blood Bank	Non BCSU	Private	1072	68
	IRCS Blood Bank, RCH-II Project	Non BCSU	Public	585	59
Ranga Reddy	Jeevadhaara Voluntary Blood Bank	BCSU	Private	4786	68

	Usha Mullapudi Cardiac Centre Blood Bank	BCSU	Private	3880	69
	BBR Multi Speciality Hospital Blood Bank	BCSU	Private	3726	69
	M/S Asian Blood Bank Of Asian Health Foundation	Non BCSU	Private	3425	62
	Rajya Lakshmi Charitable Trust Blood Bank	BCSU	Private	2251	61
	Narayana Hrudayalaya Mallareddy Hospital Blood Bank	Non BCSU	Private	2111	42
	Janani Voluntary Blood Bank	Non BCSU	Private	2034	66
	Kamineni Hospital Limited Blood Bank	BCSU	Private	2017	65
	Citizen Hospital Blood Bank	BCSU	Private	2005	78
	Owaisi Hospital and Research Centre Blood Bank	BCSU	Private	1769	61.5
	Continental Hospital Blood Bank	BCSU	Private	1516	71.5
	Aware global hospital blood bank	BCSU	Private	1434	73.5
	Malla Reddy General Hospital Bloood Bank	Non BCSU	Private	1296	45
	Life Voluntary Blood Bank	Non BCSU	Private	1164	58
	IRCS Blood Bank,Area Hospital	Non BCSU	NGO/Charitable /Trusts	667	57
	Medicity Institute of Medical Sciences Blood Bank	BCSU	Private	495	69
	Dr VRK Womens College and General Hospital	BCSU	Private	158	57
	Shadan Institute Of Medical Sciences Teaching Hospital & Research Center	BCSU	Private	-	11
Warangal	M/S Indian Red Cross Society Blood Bank,Warangal	BCSU	NGO/Charitable /Trusts	12822	66
	Govt MGM Hospital Blood Bank	BCSU	Public	9845	64.5
	Kakatiya Voluntary Blood Bank	BCSU	Private	4242	59

	Mother Voluntary Blood Bank	BCSU	Private	4110	66
	St Ann's Hospital Blood Bank	Non BCSU	Private	721	63
	Ircs Blood Bank, Area Hospital Jangaon	Non BCSU	NGO/Charitable /Trusts	199	62
	Singareni Collieries Company limited, Area Hospital	Non BCSU	Public	138	49
	Jeevan voluntary Blood Bank	BCSU	Private	-	51

7.2 NACO/NBTC – Questionnaire for Blood Banks

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

	the medical officer can be directly contacted). This is apart from the blood bank email ID provided above.			
18	Fax number			
19	Telephone number 1 – Medical Officer *(Mobile)*			
20	Telephone number 2 – Medical Officer *(Landline including STD code)*			
21	Type of blood bank as per NACO category	Model blood Bank		
		Blood Component Separation Units		
		Major Blood Bank		
		District level blood bank		
		Others		
22	Who is the blood bank owned by?	Public (Central/State/Local government)		
		Public (Other than ministry of health e.g. PSU, Army etc.)		
		NGO/Trust/Charitable – NACO Supported		
		NGO/Trust/Charitable		
		Private - Others		
23	Is the Blood Bank attached to any of the following?	Hospital		
		Lab		
		Stand alone		
24	If attached to Private Hospital, specify level of hospital	Medical College Hospital		
		Tertiary care hospital (other than medical college)		
		Secondary care hospital		
25	If attached to public/govt. hospital, specify the level of the hospital	Sub-District hospital		
		District level hospital		
		Medical College hospital		
		Tertiary care hospital (other than Medical College)		
26	If the blood bank is attached to a hospital, please specify the number of inpatient beds available			
27	Are you permitted to conduct Blood donation camp?	Yes		
		No		
28	How many Blood storage centres are linked to your blood bank?			
29	BB working hours *(Specify hours per day*)			
A2	**License Information**			
1.	**BB License Number** *(Enter your license number. This should be exactly as is displayed in your license issued by the Drugs Controller Office and will be used for verification purposes. This is a mandatory field and should be entered regardless of the status of license - under-*			

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

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

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

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

Section C
Technical – Immunohematology

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 participant in		Inter-lab	
			National	

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

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

Does the blood bank screen the following TTIs?

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

3	**Hepatitis C**	Rapid		
		ELISA		Manual ☐ Automated ☐
		CHEM		Manual ☐ Automated ☐
		NAT		Manual ☐ Automated ☐
3.1	Specify % of donors tested by Rapid Test?			
4	**Syphilis**	RPR		Manual ☐ Automated ☐
		TPHA		Manual ☐ Automated ☐
		ELISA		Manual ☐ Automated ☐
5	**Malaria**	Rapid		
		Fluorescent		Manual ☐ Automated ☐
		Slide microscopy		
		ELISA		Manual ☐ Automated ☐

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