

# Social Challenges and Opportunities in Blood Bank Distribution in India: A Literature Review

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## ABSTRACT

Blood is an important drug in times of critical medical ailments during this pandemic. Convalescent Plasma (CP) therapy is an effective way to treat critical patients which reduce the rate of intensive care unit hospitalization. Meanwhile as Plasma Bank are coming up a review was conducted on the Blood Transfusion Systems in India which lies as the backbone of the development of Plasma Bank's network. With the objective to improve the Blood Transfusion Systems in India, an analysis report of the blood banks in India is been presented. The blood bank data available in the Indian government portal data.gov.in is considered for this study. The study concludes that the blood banks in India is ununiformed in its distribution and not proportionate to the population of states and union territories. The blood storage units in India is not proposition to the blood banks which can leads to wastage of blood products. The blood bank distribution with equipment like Component Blood Separation Units (CBSU) and Apheresis is studied which can facilitate the convalescent plasma therapy in the current pandemic crisis.

**Keywords:** Blood bank; Convalescent plasma; BTS; CBSU; Apheresis; Blood storage units

## INTRODUCTION

During this pandemic caused by the severe acute respiratory syndrome coronavirus 2, the convalescent plasma therapy is one of the approved treatments for SARS-CoV-2 [1]. Convalescent Plasma (CP) therapy has also been proved as one among the efficient way used with the treatment of SARS-CoV-1, MERS-CoV over past 2 decades for quick recovery [2]. This involves collecting plasma which contains the antibodies that fight against COVID from the recovered persons to treatment for the infected. The recovered Sars-Cov-2 infected person between the ages 18-60 can donate 500-600 cc of his plasma which is collected after 14 days using therapeutic apheresis device. Among several studies with respect to Convalescent Plasma (CP) therapy, this therapy is claimed as an effective way to treat critical patients which can reduce the rate of intensive care unit hospitalization which is in high demand during this pandemic [3]. In India, as the COVID-19 cases are increasing in an exponential way, Delhi government has taken steps in setting up of plasma bank which benefits the treatment of patients in Delhi. The Indian government has approved this plasma theory can be used to save the lives of the people under severe health issues. Meanwhile as Plasma Banks are coming up a review was conducted on the BTS in India which lies as the backbone of this.

Blood Transfusion Service (BTS) is a key unit because it involves

various components related to the quality of blood maintenance and management issues in collecting blood. The National AIDS Control Organization has increased the awareness towards the transfusion transmissible infections (TTIs) during blood transfers and donations that saves lives and improves health [4]. The WHO country cooperation strategy report says India stands third in HIV/AIDS [5] which is closely associated with blood and the practices in healthcare domain. The statistical study by WHO projects that more that 95% of the high-income country has the self-sustainability of blood requirement while medium and low-level nation lack in managing their own blood requirements. Blood donation camps should be organized frequently across the nations to fulfil the day-to-day requirements of blood by the patients.

The blood banks in India were supported by National AIDS Control Organization (NACO), Ministry of Health and Family Welfare, Government of India and few by Non-NACO blood banks [6]. NACO's effort have strengthen the blood banks across the country in the provisioning of equipment's, consumables, labour and capacity building. Blood is been collected from donors by any one the three sources like walk-in in licensed blood banks, blood donation camps in any organization and mobile blood camps. In most countries, maintaining the self-sustainability of blood needs and blood contributions is a main factor that act

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as a great challenge to the government. The WHO blood safety and availability fact sheet says in 2013 only high income WHO nations have reported the 95% of self-sustainability of their usage [7]. In low- and middle-income countries the issues with non-self-sustainability is lack of motivations and proper perception towards voluntary blood donations and the blood requirement is not satisfied in low income countries due to wastage of blood products and manual errors [8,9]. Current there are so many challenges which has hindered the plasma donation due to the fear of COVID 19 among the patients. The study is conducted with the objective to improve the Blood Transfusion Systems in India during this pandemic crisis. The analysis report of the blood banks in India in line with the geographical distribution, population and facilities like apheresis and CBSU is been presented in this paper.

### BLOOD BANK DISTRIBUTION

The study on blood bank is conducted with the data provided by the government of India under National Data Sharing and Accessibility Policy (NDSAP) contributed by Ministry of Health and Family Welfare, Department of Health and Family Welfare, National Institute of Health and Family Welfare (NIHFW), New Delhi titled Blood Bank Directory (National Health Portal) updated till last month [10] posted on August 2017. The record says that there are 2823 blood banks distribution in India is not uniform over the states across the country. Though the blood banks spreads across the country and meet out the needs of the population, it's observed few districts, which is the geographic partition inside each states in India do not have one blood bank for their own needs. The count of districts which do not have a blood bank excluding the awaited data of few states provided in Rajya\_Sabha\_Session\_234\_AU1392 is taken for survey [11].

Table 1: List of States with no self-supported Blood Bank districtwise.

State	Total No. of Districts	No. of District without BB
Chhattisgarh	18	11
Meghalaya	11	8
Jharkhand	24	5
Gujarat	22	4
Uttarakhand	13	4
Karnataka	30	2
Madhya Pradesh	50	2
Himachal Pradesh	12	1
Tamil Nadu	32	1

### Study Findings

Few states in India are crowded with blood bank and few states are lacking with blood banks. The states that's has the highest blood bank is Maharashtra (332) followed by Tamil Nadu (291) and Uttar Pradesh (288). Among the union territory in India, Delhi(9) is the considered to have more blood banks than others. On analysis, there are few districts in the states of Chhattisgarh and Meghalaya where more than 50% of the districts don't have self-supported blood banks and few districts of Gujarat, Uttrakhand, Karnataka, Madhya Pradesh, Himachal Pradesh and Tamilnadu with no blood bank. Table 1 states list of states, which lack in the blood banks district wise.

On the other hand, few states like Telangana, Kerala, Andhra Pradesh, Maharashtra, Tamil Nadu, Delhi, Karnataka, Gujarat, West Bengal is highly populated with the blood banks and states Manipur, Meghalaya, Sikkim do not have the proportional banks in comparison with the number of districts as shown in Figure 1 [12].

### BLOOD BANK WITH POPULATION STUDY

Projected population for 2018 as per the seventh census operation that executed across the country in various states and union territories is taken for this survey [13]. As suggested in fact sheet given by WHO, a nation requires 1% to 3% blood with the population count [14]. As per the Global Blood Status survey report by WHO, voluntary Blood Donations in India is increased to 85% in the year 2013 when compared with the year 2012 which is 75% [15]. Figure 2 gives a comparative analysis of percentage of population with blood bank percentage across Indian states.

### Study Findings

Uttar Pradesh is the state that has the highest population followed by Maharashtra and Bihar. Delhi is the only union territory having the population more than 10 crores. The analysis concludes states like Uttar Pradesh, Bihar, West Bengal, Rajasthan, Jharkhand, Madhya Pradesh lacks in the blood bank infrastructure in proportion to the population of the corresponding state. On the other hand few state like A.& N. Islands, Tamil Nadu, Kerala, Maharashtra, Telangana, Karnataka, Punjab, Delhi have more blood banks. Few states are affected by certain common diseases and distribution of blood bank uniformly across the nation with interconnectivity remains unsolved [16].

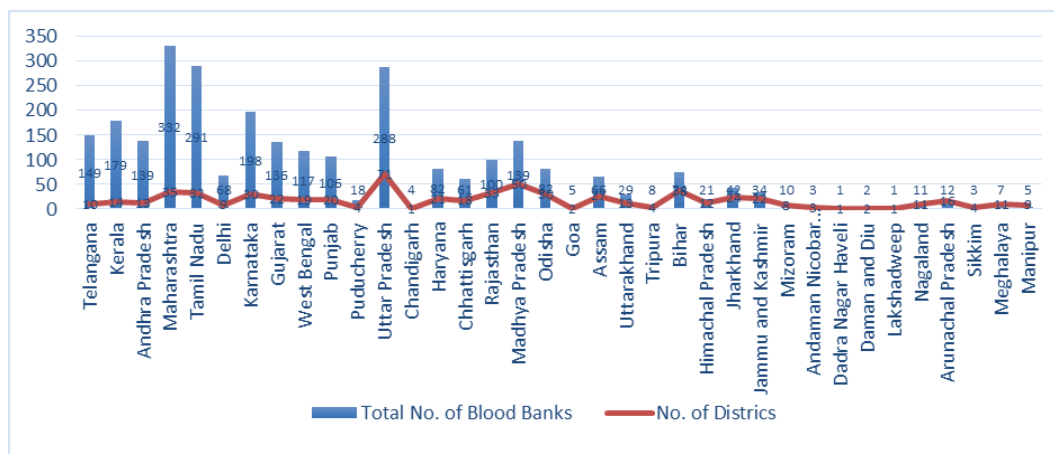


Figure 1: Comparison between Number of districts and Number of Blood Bank in each state.

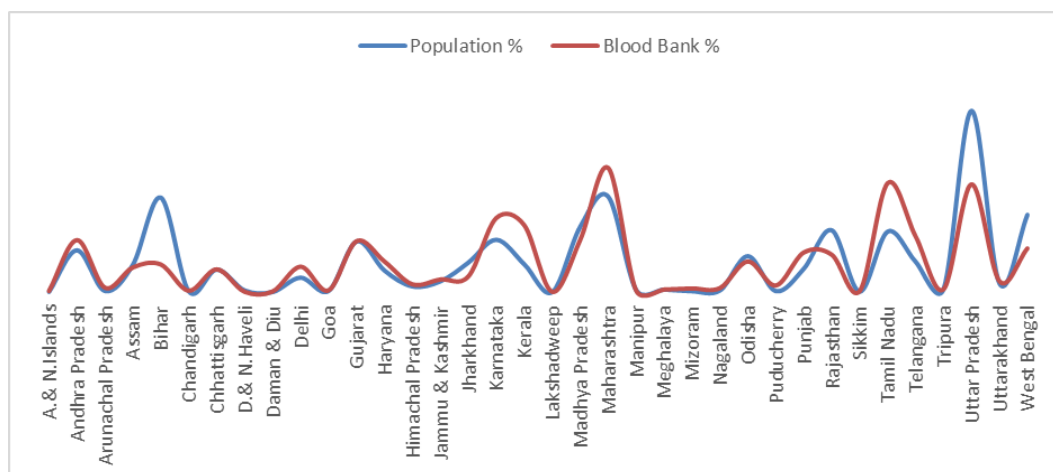


Figure 2: State wise % of Blood Bank with respect to Population.

## BLOOD BANK WITH APHERESIS AND CBSU FACILITY

Blood is required or used as whole blood or by separating the specific components in the blood. To ensure blood safely Apheresis and Component Blood Separation Units (CBSU) is the two modern equipment used in blood banks to separate the components of the whole blood collected during blood donation camps. This equipment separates the various components in the whole blood into Red Blood cell (RBC), Platelets, White Blood cell (WBC), plasma etc. The need of blood products varies from patient to patients depending upon the diseases. The blood banks are been provision with certain features reduces the donor exposure to the patients and increase the blood safety.

### Component Blood Separation Units (CBSU) Facility

The whole blood collected through voluntary blood donations centrifuged into the Component Blood Separation Units (CBSU). In CBSU the blood products is divided into red blood cells, white blood cells, platelets and plasma [17]. In this method many patients are benefited with one donor's contribution and the time period for blood donation is less when compared with the Apheresis. Majority of the blood required during surgery, trauma victims, and pediatric patients remain inadequate even though blood donations have met the need as per the population [18]. The RBC required can be satisfied by having the CBSU units established in various blood banks where the blood banks are more. India has only 38% of the blood banks have the CBSU units. Various states like Tamil Nadu, Uttar Pradesh, Karnataka, Kerala etc. that has a greater number of BB lack with the CBSU units.

### Apheresis Facility

Apheresis is new equipment introduced a decade back to separately collect the required component of blood from donor during the time of donation [14]. In this method, only the required component is extracted from the donor by a specific machine, which optimize the usage of blood donation from donor. This method is used effectively in the time of this pandemic for extracting the plasma from the COVID recovered persons [16]. The blood transfusion through Apheresis collection protects the skeletal health of the donors [15]. Even the initial cost of the machine is expensive it offers greater efficiency in extracting only the required component of the blood from donors.

## Study Findings

During this pandemic plasma is collected by apheresis facilities in the blood bank [19,20]. The study is performed in comparing to get the blood bank which has blood separation units like Apheresis and CBSU and the blood bank that has neither don't both the facilities state wise in India. Figure 3 shows the state wise comparison of number of blood banks in India that has the Apheresis equipment and CBSU facility and both. The study findings are only 15% of the blood banks have the facility of Apheresis and CBSU in India. Delhi has the highest 76 percentage of blood banks supported by the blood separating equipment's followed by Chandigarh and Maharashtra. In India 69% of states have at least one BB with Apheresis facility. The highest percentage of blood banks in the state of Uttar Pradesh and West Bengal exist without the blood separation units. In Lakshadweep and Arunachal Pradesh no blood bank has the Apheresis facility at all. In COVID affected states like Tamil Nadu and Gujarat the Apheresis facility is not in line with the total number of blood banks available.

## BLOOD STORAGE UNITS FACILITY

The safety and quality of the blood in India is regulated by NACO in storing the blood by creating the Blood Storage Units (BSU) [21]. They are further linked with government blood banks that provides the blood to the BSU. The blood can be stored for 35 to 42 days depending upon the bags used and the medical officer in BSU has to send the unused blood bags 10 days prior to the expiry [21]. Thus, storage units in hospital provides a main part in patient's life. Non-availability of blood is considering as major issue of death in case of various diseases including pregnancy [21]. The analysis focused on Figure 4 is made by comparing the number of storage facility units in each state across the total number of blood banks.

## Study Findings

Maharashtra being the highest patients infected state has the maximum number of BSU when compared to the number of blood bank and in contrast in Tamil Nadu the second COVID infected state have BSU in less number when compared to the number of blood bank situated. Lakshadweep state has no storage units. Uttar Pradesh which has the highest population and second highest blood banks has a smaller number of storage units.

Comparing the BB with Apheresis , CBSU and Both

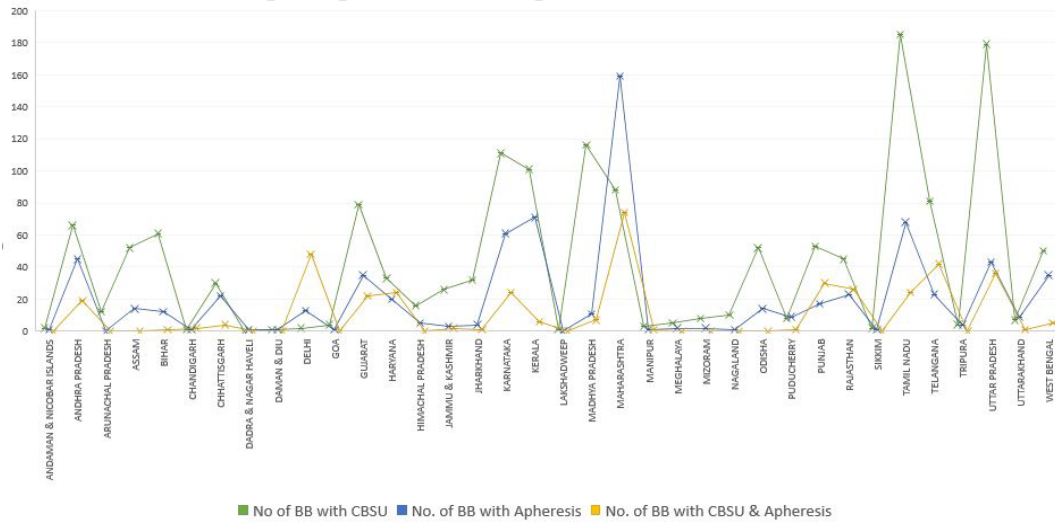


Figure 3: State wise % of Blood Bank with respect to Population.

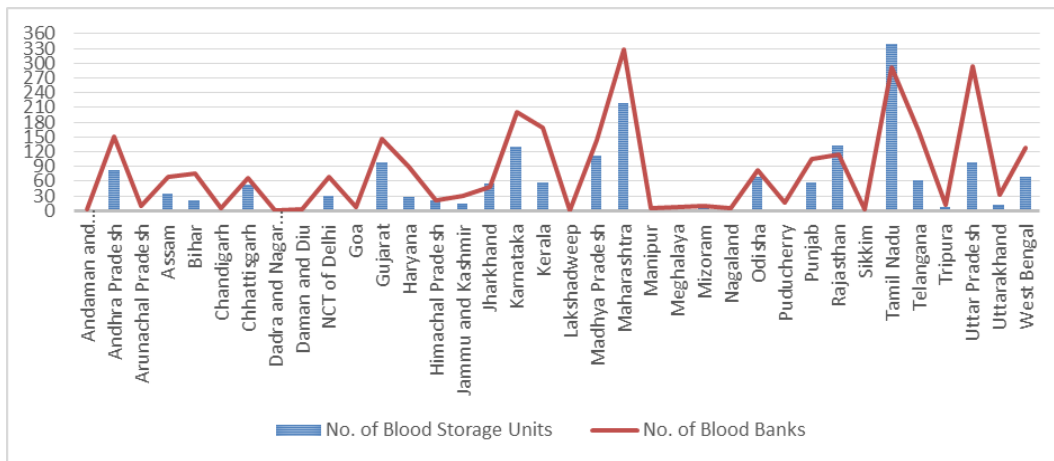


Figure 4: State wise count of Blood Storage Units vs No. of Blood Banks.

PUBLIC AND PRIVATE BLOOD BANK

The blood banks in India will be public blood banks if owned by the government and private blood bank if owned by hospitals and charitable organization. Figure 5 shows the geographical scattered of public, private and charity blood banks.

Study Findings

It also represents that majority of the private blood banks are concentrated to certain regions of the country. Two states Lakshadweep and Nagaland have only public blood banks. The figure also clearly depicts that the blood bank are concentrated towards the cities and not towards the rural areas in the country. As discussed in [12] India has to surely focus on urbanization of the health care infrastructure throughout the country the blood bank networks also to be strengthened.

CONCLUSION

Blood is an important drug that place a vital role in human life. Self-sustainability of the blood is an important criterion that has to consider by each nation. On the survey conducted with the blood bank data provided in data.gov.in, the following conclusion has been observed.

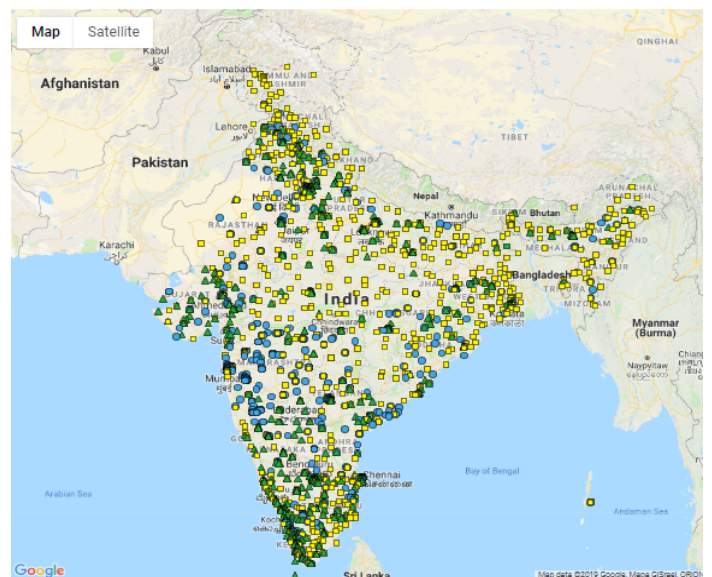


Figure 5: Location of Charity, Government and Public Blood Bank.

- Distribution of blood bank across the states is not uniform and few states is crowded with blood bank. Two states Lakshadweep and Nagaland have only public blood banks. The reason behind why there is no uniform distribution of blood banks is open for survey.

- States Chhattisgarh and Meghalaya have more than 50% of the districts with no self-supported blood banks.
  - India have 64% of blood banks owns by private hospitals or charitable organizations and 36% of blood banks is public.
  - India blood banks with Apheresis equipment has to be considered as most of the states are moving ahead in establishing the plasma blood bank during this COVID pandemic to enhance the plasma therapy.
  - Uttar Pradesh, Bihar, West Bengal, Rajasthan, Jharkhand, Madhya Pradesh lacks in the blood bank infrastructure in proportion to the population.
  - Blood Transfusion System if nationalized with the help of modern computerized technological systems can help in solving these discrepancies in the distribution of blood bank and regularization of blood products during the emergency situations.
  - During this pandemic as plasma need is arising as an important remedy for the medicine, this review can be an eye opener for further study and in improving the blood bank distribution across the country. Invention of new software to streamline the distribution of blood to be of greater scope in future.
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## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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