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Original Research Article

VOLUNTARY BLOOD DONATION IN A CENTRAL STATE OF INDIA; MADHYA PRADESH

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Abstract

Introduction: Human blood is an essential component of human life which is universally recognized as the most precious element that sustains life. The safest blood is blood acquired from regular, voluntary, non-remunerated blood donors from low-risk populations. The aim of the transfusion services is to provide a safe, sufficient and timely supply of blood and blood components to needy patients.

Aim: Present study is aimed to know the status of voluntary blood donation and transfusion facilities in Madhya Pradesh.

Materials and Methods: A total of 1657491 blood donors, donated their blood over a period of six years (1st January 2012 to 31st December 2017) at the NACO supported blood banks of Madhya Pradesh were included in the study. Data of blood donors, age, sex, type of donation, etc including their TTIs status was collected, retrieved, tabulated, summarized and compared statistically by frequency distribution and percentage proportion at Madhya Pradesh AIDS Control Society Bhopal. Chi-square (X^2) test was applied to know the significant *(p-value)* ratio of difference statistically.

Result: In the Present study voluntary blood donation was 91.9% statistically significant (p= 0.000001). Male to female ratio of blood donors in the study was 94% male to 6% female. Majority of donors (65.5 %) were of the aged between 21 to 40 years. Prevalence of TTIS among blood donors in the study was 2.01% (n=33408/1657491), statistically significant (p= 0.000001).

Conclusion: The status of transfusion services and voluntary blood donation in the state is satisfactory and more work has to be done to achieve the national targets.

Keywords: Voluntary Blood Donors, Relative Blood Donors, Transfusion Transmitted Infection.

Introduction:

Blood Transfusion Service (BTS) is an essential part of modern healthcare system without which medical care is impossible [1]. Till today; there is no substitute of human blood [2]. What so ever under trail; placental, cadaveric and artificial blood are not fulfilling the desired parameters or unable to establish as an alternate source of whole human blood. So, the main focus of transfusion medicine personals is on voluntary donation and blood component therapy to meet out the gap between demand and supply, especially in underdeveloped and developing countries like India [3, 4].

The history of voluntary blood donation in India dates back to 1942 during the Second World War when blood donors were required to help the wounded soldiers. The first blood bank was established in Kolkata, West Bengal in March 1942 at the All India Institute of Hygiene and Public Health and was managed by the Red Cross.[5, 6].

Availability of safe blood and blood products is a critical aspect of improving health care [7]. A blood transfusion saves millions of lives each year, but adequate and safe blood supply is a demanding challenge in developing countries like India. Hence World Health Organization (WHO) has adopted a policy aimed at 100% voluntary donor blood procurement by the year 2020 [8]. Time to time Government of India had taken following steps to ensure safe and adequate blood/component to all needy.

1. Human blood is covered under the definition of a drug under the Drugs and Cosmetics Act, 1940. Blood bank activities are regulated under this act and they are required to obtain timely renewal of the license from Drug Controller General for operation and have to comply with the terms presented in the license. It specifies about accommodation, manpower, equipment, supplies and reagents, good manufacturing practices, and process control to be followed in Indian blood transfusion services.[9]
2. The National AIDS Control Organization (NACO) was formed in 1992 following the outbreak of AIDS. Following a public interest litigation, a verdict by the supreme court in the case of Common Cause vs. the Union of India in January 1992 led to the establishment of National Blood Transfusion Council (NBTC) at the federal level and State Blood Transfusion Councils (SBTC) for all the states to review the status of blood transfusion services in the country and conduct annual monitoring visits to blood banks[10].
3. A public interest litigation was filed in the Supreme court in 1996 to abolish the practice of selling blood which became effective on 1 January 1998[11]. Selling or donating blood in exchange for money is illegal under the National Blood Transfusion Services Act 2007 and those found convicted may face a prison sentence of up to three months with fine.[12, 13]
4. In 1997, HIV counseling and testing services were started in India. In 2001, testing of blood for hepatitis C virus (HCV) antibodies was made mandatory [14]. Presently as per guidelines of National AIDS Control Organization (NACO) of India, it is mandatory to test each and every blood unit for HIV, HCV, HBsAg, Syphilis, and Malaria [15].

A total of the 112.5 million blood donations collected globally, approximately half of these are collected in high-income countries, home to 19% of the world's population [16]. Based on samples of 1000

people, the blood donation rate is 32.1 donations in high-income countries, 14.9 donations in upper-middle-income countries, 7.8 donations in lower-middle-income countries and 4.6 donations in low-income countries [16].

In India, the number of voluntary blood donors increased from 54.4% in 2006-2007 to 83.1% in 2011-2012, with the number of blood units increasing from 4.4 million units in 2006-2007 to 9.3 million units in 2012-2013[6]. In 2016, the Ministry of Health and Family Welfare reported a donation of 10.9 million units against a requirement of 12 million units [17]. Blood donors in India donate around 350 milliliters of blood [18]. After a donation, the donors are provided with refreshments, which usually include a glucose drink, biscuits, and fruits. Some organizations offer transportation facilities, apart from providing certificates or badges as a gratitude [19].

The present study aims to provide the relevant blood donation data and status of blood transfusion services of Madhya Pradesh in the purview of accessibility and availability of safe blood to every needy.

Materials and methods:

In the present study, data were collected from NACO supported Blood Banks of Madhya Pradesh and compiled at Madhya Pradesh state AIDS Control society (MPSACS) Bhopal, India. A total of 1657491 blood donors donated their blood during the study period of six years (1st January 2012 to 31st December 2017). Before donation, donors were screened by trained personnel for satisfactory answering the donor's questionnaire, their physical examination, and Hemoglobin (Hb %) estimation. A total of 1657491 blood units from the selected donors were collected. These donors were Voluntary Donors (VD) and Replacement Donors (RD). Replacement donors were those donors who donated blood for ailing patients and were family members, close relatives, and friends of the recipient. The Voluntary donations were obtained from walk-in donors at the blood bank and in voluntary blood donation camps organized by different institutions, neighboring colleges, different social and political organizations. Professional and paid donors were carefully eliminated. Written consent from the donor was also taken prior to donation. Blood units were tested for transfusion-transmitted Infections (TTIs) i.e. HIV, HbsAg, HCV, VDRL and Malaria prior to issuing blood/blood components. TTIs positive units were discarded as per NACO guidelines. Blood components were prepared at seven licensed blood components centers in Madhya Pradesh and rest of blood bank issue whole blood only.

Last six years data of blood donors, age, sex, type of donation, etc and their TTIS status of NACO supported blood banks of Madhya Pradesh was collected, retrieved, tabulated, summarized and compared statistically by frequency distribution and percentage proportion at Madhya Pradesh AIDS Control Society Bhopal. Hereby we were publishing the data in accordance with ethical approval and consent of MPSACS. Chi-square (X^2) test was applied to know the significant *(p-value)* ratio of difference statistically.

Results:

A total of **1657491** blood donors donated their blood during the study period. Voluntary versus relative donation in the study was 91.9% (n =1523110/ 1657491): 8.1% (n 134381/1657491) respectively (figure no 1), statistically significant (p= 0.000001). Increasing pattern involuntary donation from 2012 to2017 was also observed in the study which was shown in figure no 2 and tables no 1, statistically significant (p= 0.000001*)*.

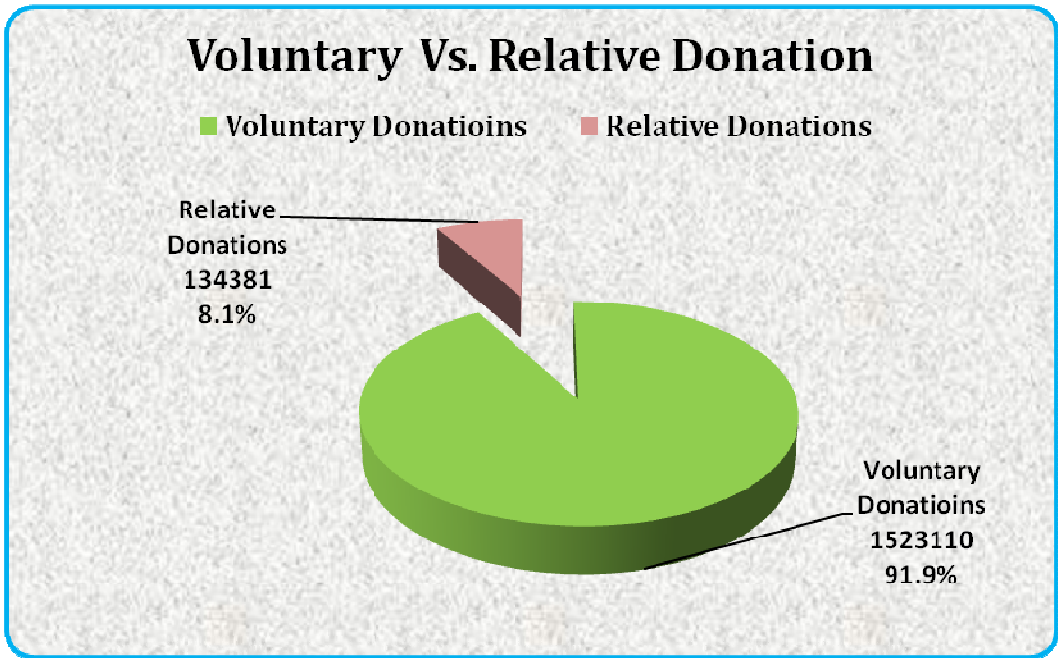

Figure no 1: Voluntary vs. Relative Donation in the study

Table no 1: Voluntary Vs Replacement Donors in the study

S.NO.	Year	Total Donors	Voluntary Vs Replacement Donor		P value
			Voluntary donors	Replacement Donor	
1	2012	223600	190731 (85.3%)	32869 (14.7%)	*P= (0.000001)*
2	2013	236969	211613 (89.3%)	25356 (10.7%)	*P= (0.000001)*
3	2014	272370	246767 (90.6%)	25603 (9.4%)	*P= (0.000001)*
4	2015	283594	265728 (93.7%)	17866 (6.3%)	*P= (0.000001)*
5	2016	319623	303003(94.8%)	16620 (5.2%)	*P= (0.000001)*
6	2017	321335	305268 (95.0%)	16067 (5.0%)	*P= (0.000001)*
7	Total	1657491	1523110 (91.9%)	134381 (8.1%)	*P= (0.000001)*

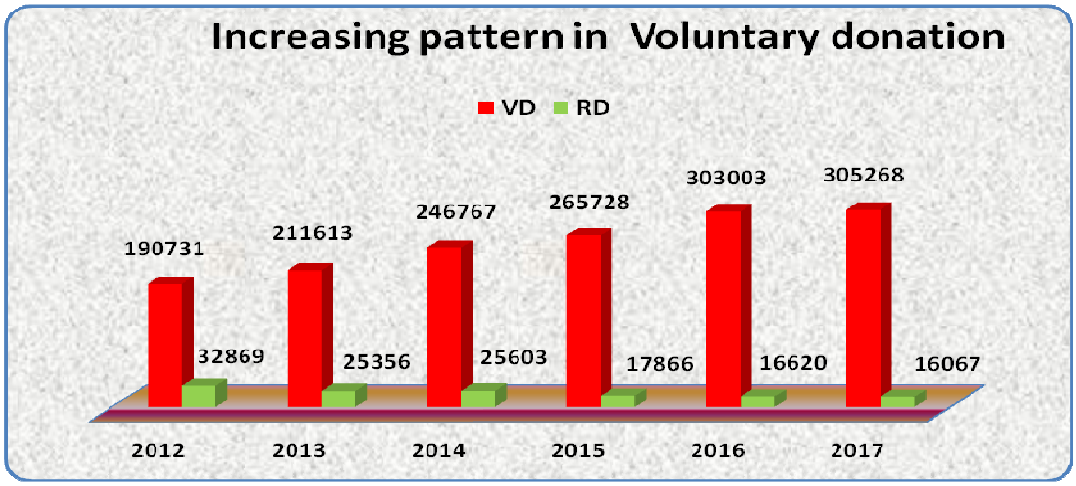

Figure no 2: Increasing pattern of Voluntary Donation in the study

Male to female ratio of blood donors in the study was 94% (n= 1557991/1657491) male and 6% (n= 99500/1657491) female as shown in figure no3, statistically significant (*p*= 0.000001).

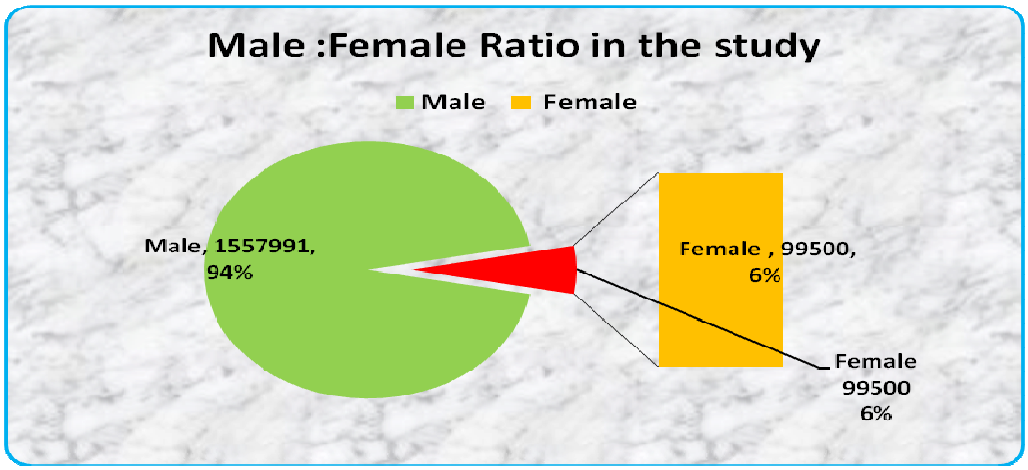

Figure no 3: Male to Female ratio in the study

Most common age group of the donors was 21-30 Years (35%), closely followed by the age group 31-40 years (30.5%) and density distribution of donors according to their age groups was shown in table no 2 and figures no 4, statistically significant (*p*= 0.000001).

Table no 2: Age group wise distribution of donors

S. No.	Age group	Donations	Percentage	P Value
1	<20	91450	5.5	*P=.000001*
2	21-30	580120	35	
3	31-40	505273	30.5	
4	41-50	265182	16	
5	51-60	165746	10	
6	>61	49720	3	
7	Total	1657491	100	

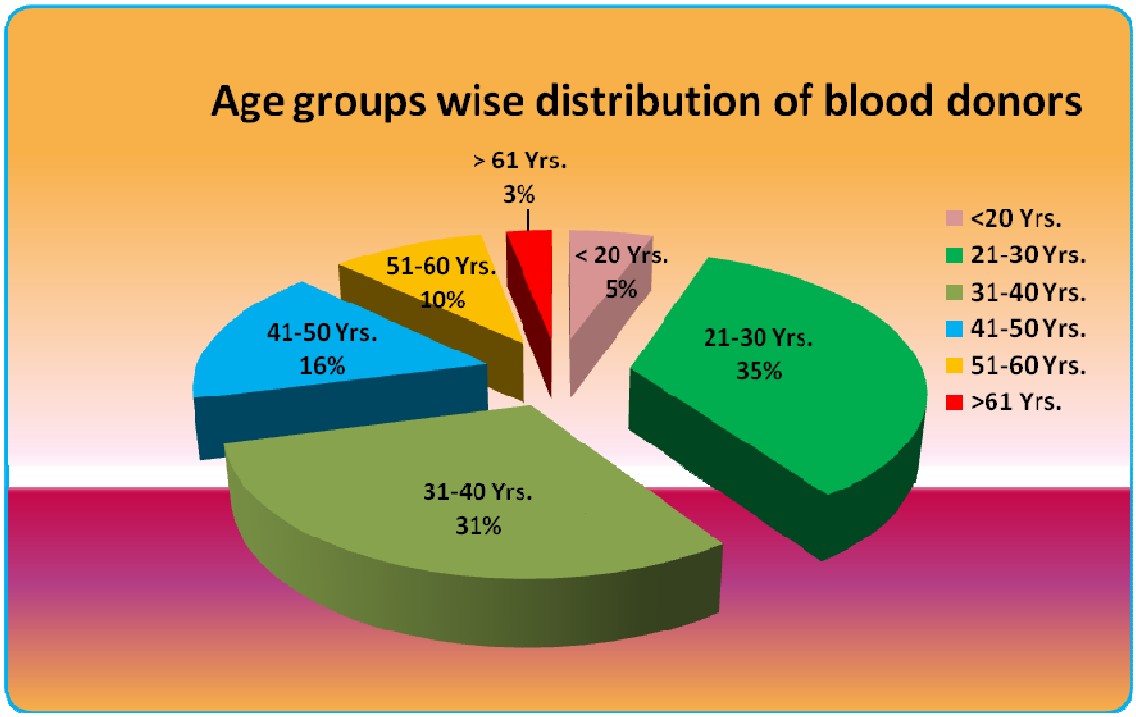

Figure no 4: Distribution of donors according to age groups

Prevalence of TTIs amongst the blood donors in the study was **2.01%** (n=33408/1657491). Sero-prevalence of different transfusion-transmitted Infections in the study and its yearly breakup was shown in the table no 3 and figure no5, the frequency distribution is statistically significant (*p*= 0.000001).

Table no 3: TTIs status of donors in the present study.

S.No.	Year	Donations	HIV	HBsAg	HCV	VDRL	Malaria	Total THIS
1	2012	223600	264	3565	294	1035	99	5257
2	2013	236969	224	3285	286	1081	132	5008
3	2014	272370	234	3213	292	1092	133	4964
4	2015	283594	231	2930	191	1117	106	4575
5	2016	319623	248	3677	272	1085	138	5420
6	2017	321335	348	3872	342	1455	2167	8184
7	Total	1657491	1549	20542	1677	6865	2775	33408

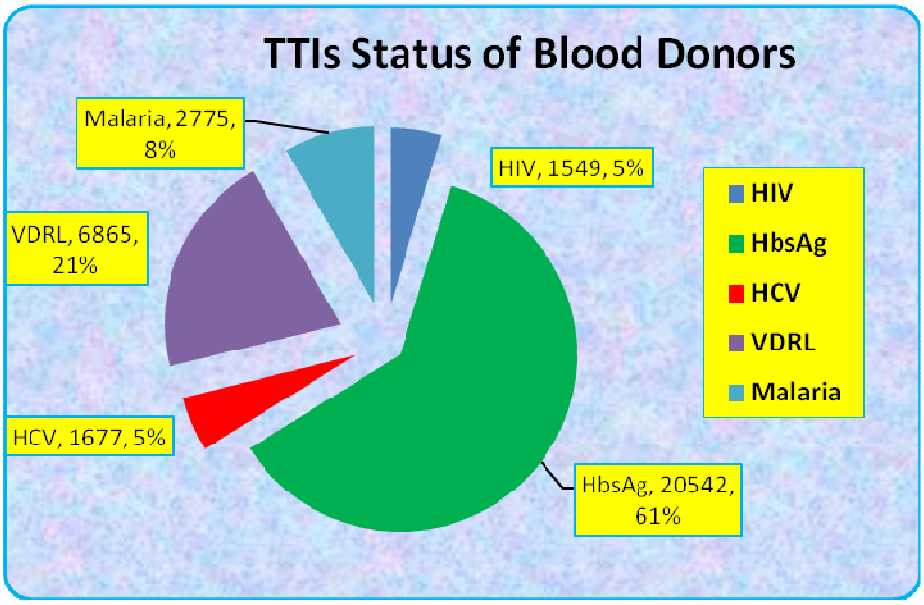

Figure no 5: TTIs status of blood donors, in the present study.

Discussion:

Human blood is an essential component of human life which is universally recognized as the most precious element that sustains life [7]. The aim of the transfusion services is to provide a safe, sufficient and timely supply of blood and blood components to needy patients [20]. The safest *blood* donors are regular, voluntary, *non-remunerated blood donors* from low-risk populations [21, 22]. Two critical issues are there in front of the transfusion medicine personals; Firstly to patch up the gap between demand and supply and secondly to achieve the goal of 100% voluntary blood donation by the year 2020, a goal set by WHO [8]. According to World Health Organization (WHO), 1%, a country's population is generally sufficient to meet a country's basic requirements for safe blood [23]. In India deficit between demand and supply of blood in the year 2017 was10% (820 lakhs units collected against the demand of 100 lakhs) [17, 24] while in our previous study Yadav UC et al 2018 this deficit was reported 20% in Madhya Pradesh in the year 2017 [25]. It is because of the facts; 1. A study conducted in 2011 reports that a low, mere 6% of women (approximately equal male: female population ratio) donate blood, mostly due to physiological problems and low hemoglobin count [26]. 2. Disparities in access of donors in different areas have led to wastage of bloodstock in some parts of the country, while at the same time creating a shortage of blood in some other parts [27]. 3. Blood Component Separation units (BCSU) are restricted up to the bigger cities and at Medical College level and in rest of the state, whole blood is available for the patients [25]. To meet out the above three problems; female participation in blood donation should encourage, proper distribution of blood /blood component should be ensured and more BCSU should be established in Madhya Pradesh.

In 2017, voluntary blood donation in Madhya Pradesh was 95% (n=3052680) against the total donation of 321335 units with the deficit of demand vs. supply was 20% units [25]. Variable data was reported from different part of India regarding blood donation and deficit between demand and supply. Overall India has 9% short of its needs in 2016 –the shortage reducing from

17% in 2013-2014. Bihar is 84% short of its blood requirements, more than any other state, followed by Chhattisgarh (66%) and Arunachal Pradesh (64%). Chandigarh had almost nine times the blood it needed, Delhi three times, Dadra and Nagar Haveli, Mizoram, and Pondicherry twice, according to Government data [28]. India has 2,708 blood banks, but 81 districts still lack one, according to Government data. Chhattisgarh has the most districts without a blood bank (11), followed by Assam and Arunachal Pradesh (9) [28, 29]. To meet out such problem NACO and National Blood Transfusion Council (NBTC) of India established Blood Storage Centers (BSC) in remote areas and also made sate up to mobilize blood/ components from excess to crises areas.

To promote voluntary blood donation and to ensure safe blood for needy, NACO & NBTC at the national level and SBTC & MPSACS at state level launch various programs and activities like; educational, awareness, donor motivation, advertisement through media, interaction, publications and other programs. Important dates are 14th June; world Blood Donors day, 1st October; National Voluntary Blood Donation day and 1st December; World Aids day. Months June, October, and December are also celebrated as Voluntary blood donation months.

In the present study prevalence of TTIs is 2.01% (n=33408/1657491) and sero-prevalence of various infections are; most frequently HbsAg 1.24 % (n=20542/ 1657491) followed by VDRL 0.41% (n=6865/1657491), malaria 0.16% (n=2775/1657491), HCV 0.10% (n=1667/1657491) and HIV 0.09% (n=1549/1657491) where percent contribution among infections is HbsAg 61%, VDRL 21%, Malaria 8%, HCV 5% and HIV 5%.The prevalence of TTIs among the Indian blood donors is reported to be ranging as follows; HBV – 0.66% to 12%, HCV – 0.5% to 1.5%, HIV– 0.084% to 3.87%, and syphilis – 0.85% to 3% respectively.[30, 31]. In our study HbsAg 1.24% is most common infection among all TTIs which is similar to findings by Chattoraj A *et al* ,[30] Kaur *et al,[*32] and Singh B *et al*,[33]. Variable results of 0.66%, [34] 2.45%, [35] 3.44%, [36] 5.86%, [37] 25% [38] have also been reported in various other studies. Low prevalence of HCV (0.10%) was reported in the present study as compare to the other studies from India; 0.28% [36], 0.50% [33], 0.79% [30], 0.88% [39], 1.09%, [34] and 1.57%,[40]. In the present study, the prevalence of HIV was found to be 0.09%. Similar findings by Gupta *et al*,[34] and Tiwari *et al* , [41] reported 0.084% and 0.054% prevalence of HIV among blood donors, whereas lower sero-prevalence of 0.0%[37] and higher sero-prevalence of 0.13%, [30] 0.19%, [42] 0.26%, [32] 0.47%, [36] 3.8% [43] and 11.7% [38] have been reported. For syphilis, the sero-prevalence was found to be 0.41% in the present study, which was much lower than reported by other studies 0.85% [34] and 1.2% [37]. *Indian* population resides *in malaria endemic areas;* 80% *of malaria* reported in the country is confined to *areas* where 20% of population resides - in tribal, hilly, hard-to-reach or inaccessible *areas [44]*.

Challenge for transfusion services, state /central Government is to achieve the 100% Voluntary donation by the year 2020 and to provide the safe and quality blood/ blood component to the needy patient as much as he/she is required at right time. The target may be difficult but reachable and can be achieved by combined efforts.

Conclusion:

The status of transfusion services and voluntary blood donation in the state is satisfactory and more work has to be done to

achieve the national targets.

Acknowledgment:

The author (s) is thankful to all blood bank staff members in Madhya Pradesh and MPSACS personals for their regular cooperation without which this work could not possibly.

Consent

The author(s) declare that written informed consent was obtained from the blood donors before being recruited for donation.

Ethical Approval

All author(s) hereby declare that all procedure have been examined and approved by the appropriate ethics committee of MPSACS, Bhopal, India, and research have therefore been performed in accordance with the ethical standards laid down in the 1964 declaration of Helsinki.

Competing Interests

Authors have declared that no competing interests exist.

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