

Prevalence of HIV among Blood Donors at Madhya Pradesh, a Central State of India

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Abstract:

Background: Acquired Immunodeficiency Syndrome (AIDS) which can affect people of any age group caused by Human Immunodeficiency Virus (HIV). There's no complete cure for HIV till Date. Incidence among donors reflects the overall disease burden on the society. It can be transmitted by sexual intercourse, sharing of needles, transfusion of blood and blood products and vertical transmission from mother to child. Transfusion Transmitted Infections (TTIs) Threaten safety of the recipients and the community as a whole and are the subject of real concern worldwide.

Aims And Objectives: The purpose of this study is to estimate the prevalence of HIV infection among the blood donors, those comes to donate blood at different Blood Banks of Madhya Pradesh India, For a period of ten years, i.e.. From: 2008 to 2017.

Materials And Methods: A retrospective analysis of medical records of blood donors who met the standard criteria for donor fitness and donated blood at blood banks, of Madhya Pradesh, India. Donor's blood units were screened for HIV and other TTIs from January 2008 To December 2017 (10 Years). The HIV Data of last ten years was collected, retrieved, tabulated, summarized and compared statistically by frequency distribution and percentage proportion. Chi Square (X^2) test was applied to know the significant (p value) ratio of difference statistically.

Results: Out of the total 2404582 donors tested for HIV infection, 2637 (0.10%) were found to be HIV sero-positive ($p=.000001$).

Conclusion: The prevalence of HIV was 0.10% among blood donors of Madhya Pradesh, a Central State of India and showed decline pattern from 2008 to 2017.

Key Words: Transfusion Transmitted Infections (TTIs), Blood Donor (BD), Human Immunodeficiency Virus (HIV). Acquired Immunodeficiency Syndrome (AIDS)

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I. Introduction:

India has the third largest Human Immunodeficiency Virus (HIV) epidemic in the world. In 2016, HIV prevalence in India was an estimated 0.3%. [1] This figure is small compared to most other middle-income countries but because of India's huge population (1.324 Billion), this equates to 2.1 million people living with HIV [1]. In the same year, an estimated 62,000 people died from acquired immunodeficiency syndrome (AIDS)-related illnesses [1]. Overall, India's HIV epidemic is slowing down, with a 32% decline in new HIV infections (80,000 in 2016), and a 54% decline in aids-related deaths between 2007 and 2015 [1, 2, 3]. Human Immunodeficiency Virus (HIV) was discovered in 1983 by Barre-Sinoussi *Et Al.* [4]. HIV is a Lentivirus (A Subgroup of Retrovirus) that causes HIV infection and acquired immunodeficiency syndrome (AIDS) [5, 6]. The full pathogenic potential of human retroviruses was not realized until HIV was established as the cause of aids in 1984 [7]. AIDS is a condition in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive. Without treatment, average survival time after infection with HIV is estimated to be 9 to 11 years, depending on the HIV subtype. The disease is transmitted by sexual intercourse, sharing of needles, transfusion of blood and blood products and vertical transmission from mother to child. HIV is present in body fluids in the form of free virus particles and also within infected immune cells. HIV infects vital cells in the human immune system such as Helper T Cells (Specifically Cd4⁺ T Cells), macrophages, and dendritic cells [8]. It leads to lowering the level of Cd4 + T Cells through a number of mechanisms including apoptosis of uninfected bystander cells [9]. The HIV/AIDS epidemic is one of the largest

public health crises of the 21st century, which has evolved from a mysterious illness to a global pandemic in less than 20 years. However, in 2007, a total of 33.2 Million [30.6 – 36.1 Million] People Were Living with HIV globally, 2.5 Million [1.8 – 4.1 Million] People became newly infected and 2.1 Million [1.9 – 2.4 Million] people died of AIDS [10].

Although globally, as well as in India, the predominant mode of HIV transmission is through heterosexual contact, the risk of contracting HIV infection from transfusion of a unit of infected blood is estimated to be over 95% [11]. Transfusion of blood and/or its components is a life saving measure but at the same time it has life threatening hazards also [12]. Blood transfusion carries the risk of Transfusion Transmissible Infections (TTIs), including HIV. Five Tests i.e. HIV, HCV, HbsAg, VDRL and Malaria Parasite were made mandatory in the year 2001 in India prior to the issue of compatible blood to the patient [13]. WHO recommend these tests are mandatory before transfusion of blood and blood components for Asia specific region. With every unit of blood, there is 1% chance of transfusion-associated problems including transfusion-transmitted diseases [14]. In 1992, Government of India demonstrated its commitment to combat the disease with the launch of the First National Aids Control Programme (NACP-I) as a comprehensive programme for prevention and control of HIV/AIDS in India [15]. Today we stand at the beginning of NACP IV.

Present study is aimed to provide the status of HIV/ AIDS in blood donors which also reflect the status of society too.

II. Materials And Methods:

Present study was carried out at National Aids Control Organization (NACO) supported blood bank and MPSACS (Madhya Pradesh State Aids Control Society) Bhopal, Madhya Pradesh, India. Donors were screened by trained personnel after satisfactory answering the donor's questionnaire, their physical examination and hemoglobin (Hb %) estimation. A total of 2404582 blood units from the selected donors were collected over a period of ten years (1st January 2008 to 31st December 2017). 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 recipient. The voluntary donations were obtained from walk in donors at 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. 3 ml blood in plain vial and 2 ml blood in EDTA (ethylene diamine tetra acetic acid) vial taken from the satellite bag. All samples were screened for HIV and other transfusion transmitted diseases. Tests were performed with commercially available HIV Elisa Kits-III & IV generation and on and off rapid card were also used for detection of HIV antigen /antibodies

Serovigilance of all the test results was performed by a different State Reference Laboratory (SRL), of Madhya Pradesh. The sero-positive blood units were discarded as per guidelines of NACO, whenever the pilot donor samples were found positive for any TTIs. The HIV data of last ten years of Madhya Pradesh was collected, retrieved, tabulated, summarized and compared statistically by frequency distribution and percentage proportion. Chi Square (X^2) Test was applied to know the significant (*p value*) ratio of difference statistically.

III. Results:

Blood from **2404582** apparently healthy donors aging 18 - 65 years was collected during the study period. Male to female donor's ratio in the study was 93.8% (2255416) and 6.2% (149166) Respectively, Statistically Significant ($P=0.000001$) (Figure 1).

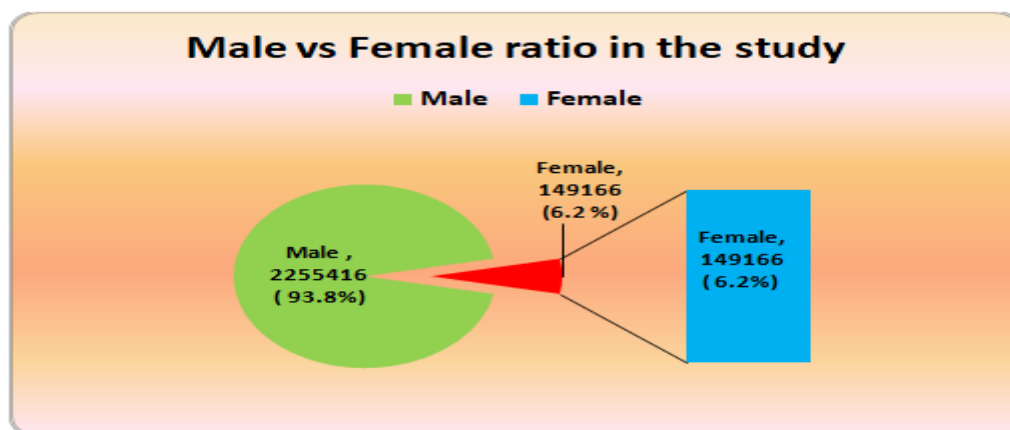


Figure No. 1: Male: Female Ratio

Out Of 2404582 donors, 2093504(87.1%) were voluntary blood donors while 311078 (12.9 %) were relative blood donors statistically significant ($P=0.000001$) (Figure No. 2).

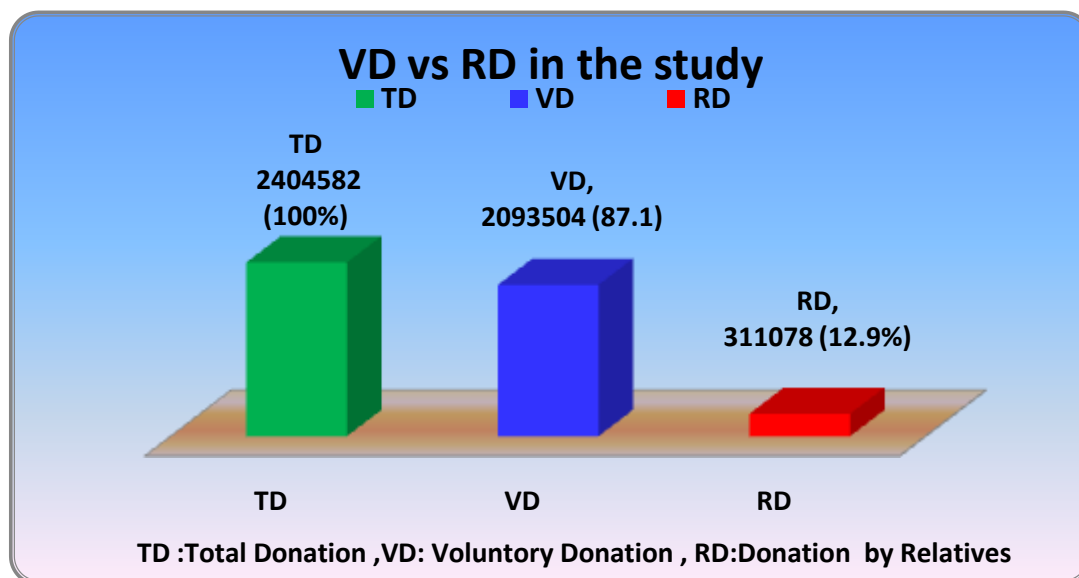


Figure No. 2: Total Blood Units Collected Voluntary Verses Replacement

Increasing trend in blood donation was reported from the year 2008 to 2017 was shown in Table No. 1 and Figure No. 3.

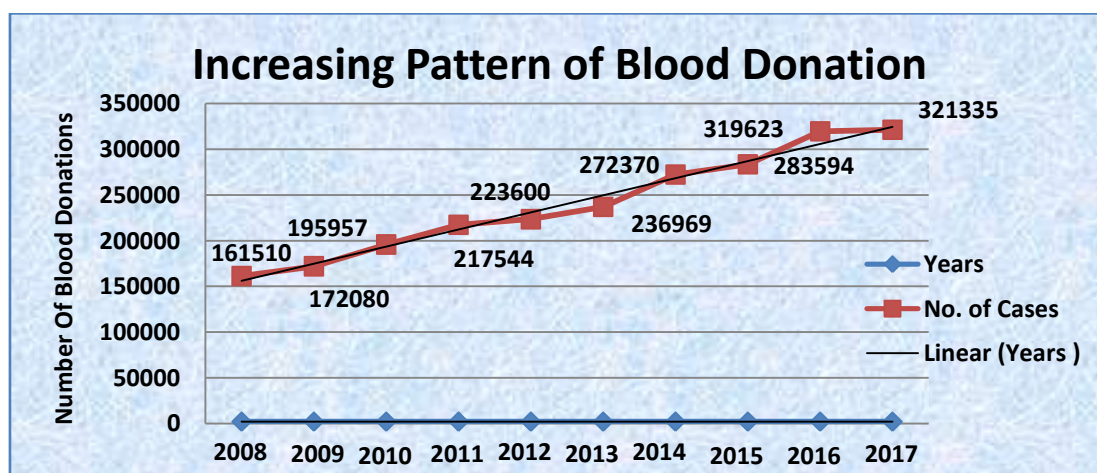


Figure No. 3: Increasing Trend in Voluntary Blood Donation

An increasing trend in voluntary blood donation was also reported in the study from the year 2008 to 2017 was shown in Table No. 1 and Figure No. 4.

Table No. 1: Yearly Voluntary vs. Relative Donors—Year 2008 To 2017.

Year	Total Number Of Blood Donations	Voluntary Vs Replacement Donor		P Value
		Voluntary Blood Donors	Replacement Blood Donors	
2008	161510	105628 (65.4%)	55882(34.6%)	$P= (0.002)$
2009	172080	129404 (75.2%)	42676 (24.8%)	$P= (0.000001)$
2010	195957	157157 (80.2%)	38800(20.8%)	$P= (0.000001)$
2011	217544	178205 (82.6%)	39339 (18.4%)	$P= (0.000001)$
2012	223600	190731 (85.3%)	32869 (14.7%)	$P= (0.000001)$
2013	236969	211613 (89.3%)	25356 (10.7%)	$P= (0.000001)$

2014	272370	246767 (90.6%)	25603 (9.4%)	P= (0.000001)
2015	283594	265728 (93.7%)	17866 (6.3%)	P= (0.000001)
2016	319623	303003(94.8%)	16620 (5.2%)	P= (0.000001)
2017	321335	305268 (95.0%)	16067 (6.0%)	P= (0.000001)
Total	2404582	2093504 (87.1%)	311078 (12.9%)	P= (0.000001)

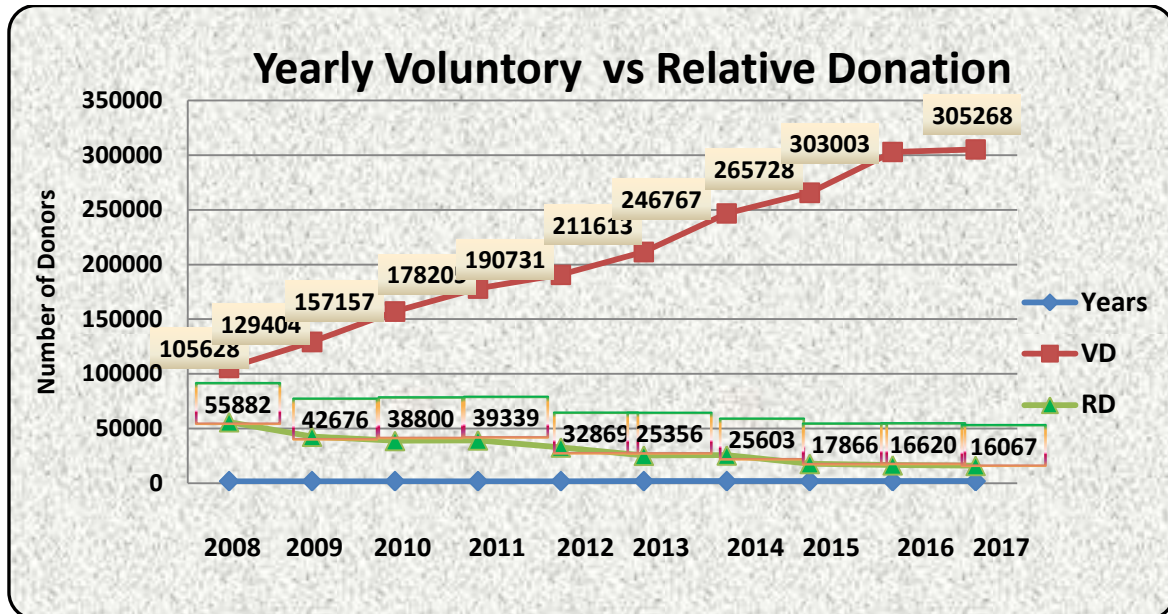


Figure No. 4: Trend Of Voluntary Blood Donation In The Study.

Out of 2404582 Blood Units/ (Blood Donors) tested for HIV, 2637 (0.10%) were positive for HIV Infection, statistically significant ($P=0.000001$) (Figure No. 5).

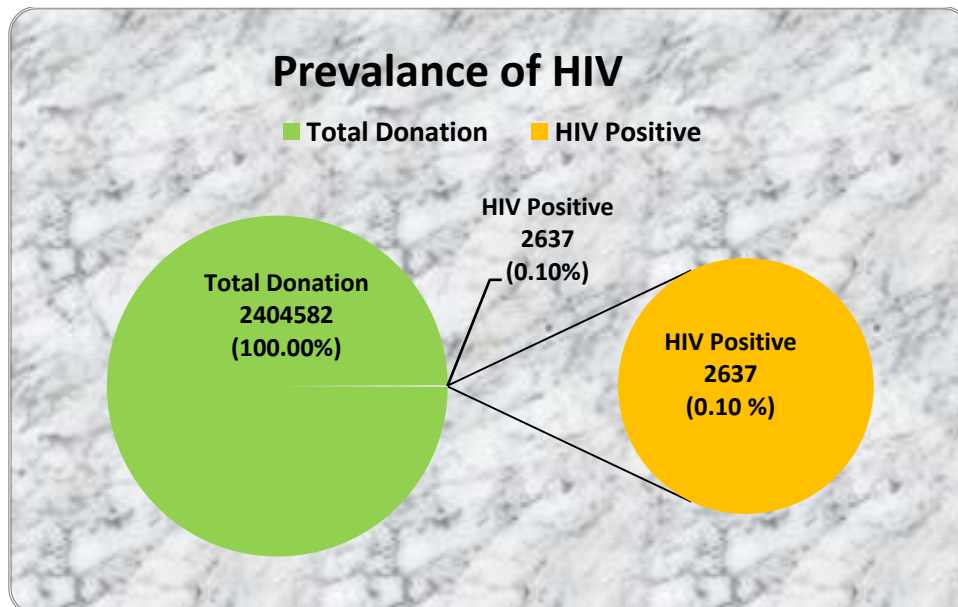


Figure No. 5:– Prevalence of HIV in the study.

Yearly sero-positive cases Of HIV in the present study from 2008-2017 was shown in Table No.2 Figure No. 6, Statistically Significant ($P=0.000001$) and its prevalence shown in Table No. 7.

Table No.2: Yearly HIV positivity—Year 2008 to 2017.

S.No.	Year	Total Donors	HIV Reactive	Percentage (%)	P Value
1	2008	161510	257	0.16	P= 0.000001
2	2009	172080	244	0.14	P= 0.000001
3	2010	195957	270	0.13	P= 0.000001
4	2011	217544	317	0.14	P= 0.000001
5	2012	223600	264	0.11	P= 0.000001
6	2013	236969	224	0.09	P= 0.000001
7	2014	272370	234	0.08	P= 0.000001
8	2015	283594	231	0.08	P= 0.000001
9	2016	319623	248	0.07	P= 0.000001
10	2017	321335	348	0.10	P= 0.000001
	Total	2404582	2637	0.10	P= 0.000001

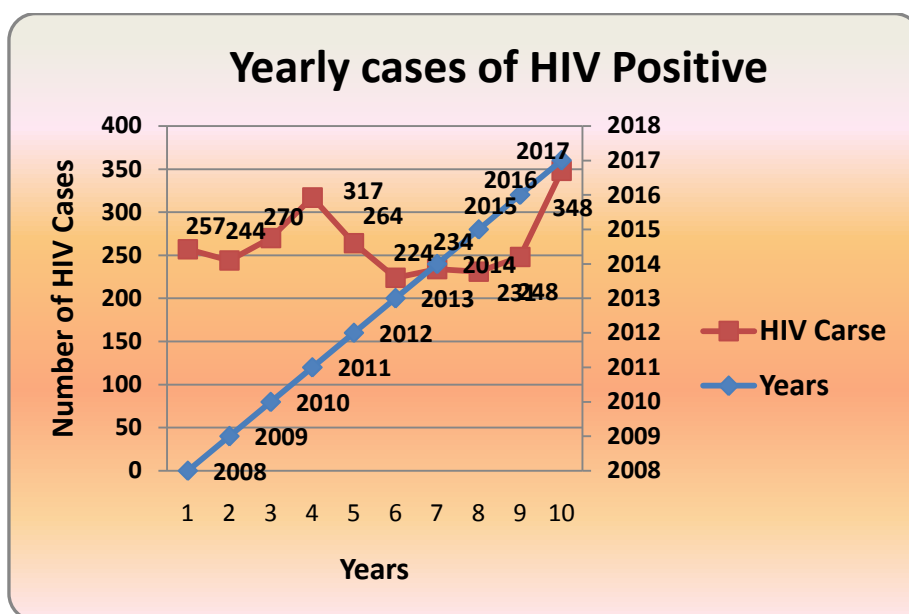


Figure No. 6: Year wise number of Seropositivity cases in the study.

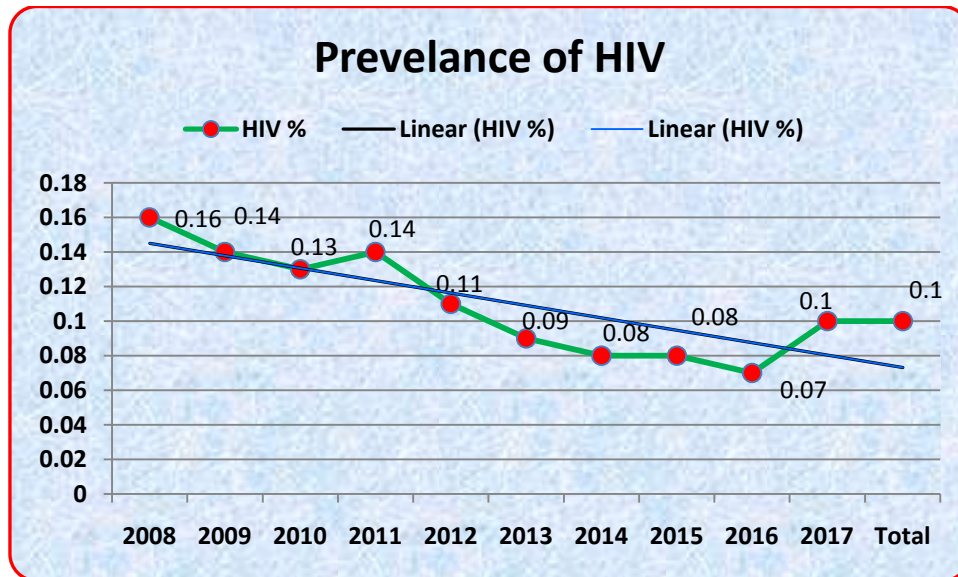


Figure No. 7: Decreasing pattern of HIV Prevalence from 2008-2017.

In Madhya Pradesh geographical distribution of HIV cases was shown in Figure No.8.

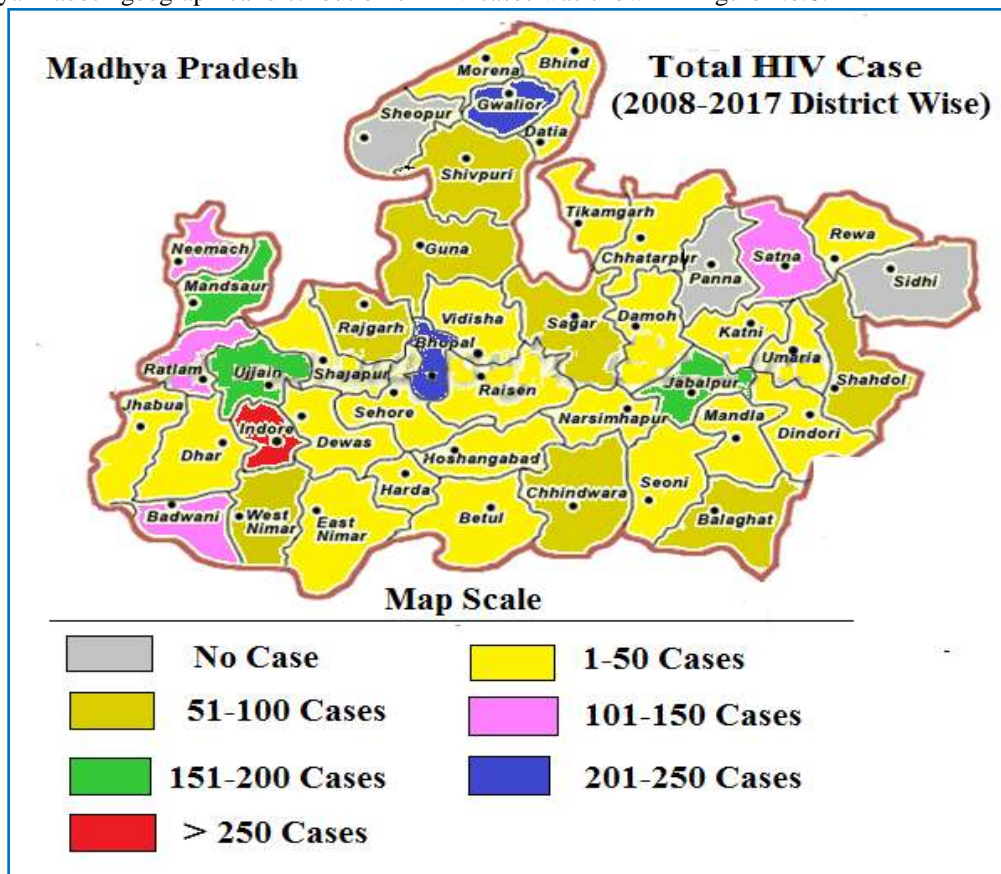


Figure No. 8: HIV positive donors reported in Madhya Pradesh (2008-2017; District wise)

IV. Discussion:

It is obvious from the result that there is 50% increase in the blood donation in the state from 2008 to 2017; still there is a gap between demand and supply. According to World Health Organization (WHO), 1% a country's population is generally sufficient to meet a country's basic requirements for safe blood [16]. In 2017 total requirement of safe blood in Madhya Pradesh was approximately 7.8 Lakhs Units i.e. 1% of Madhya Pradesh population of 788 Lakhs in 2017) [17] while we had collected approximately 6.21 Lakhs Units

(3.21lakhs From NACO supported blood banks + 3lakhs from private blood banks). So still there is a deficit of 1.59 Lakhs Units i.e. 20% in Madhya Pradesh while in India this deficit was 10% (820 Lakhs Units collected against the demand of 100 lakhs) [18, 19]. It is because of the facts; 1. A study conducted in 2011 reports that a low, mere 6% of women (approximately equal male: female ratio in India's population) donate blood, mostly due to physiological problems and low hemoglobin count [20]. 2. Disparities in access of donors in different areas have led to wastage of blood stock in some parts of the country, while at the same time creating a shortage of blood in some other parts [21]. 3. Blood Component Separation Units (BCSU) is restricted up to the bigger cities and at medical college level and in rest of the areas, whole blood is available for the patients.

The safest blood donors are voluntary, non-remunerated blood donors from low-risk populations [22]. In the present study increasing patten of voluntary blood donation was reported from 2008 to 2017 i.e. from 65.4 % to 95 % alike to the India's over all data i.e. in the year 2006-07, VBD was only 54.4%, it increased steadily to 59.1% in 2007-08, 61.7% in 2008-09, 74.1% in 2009-10, 79.4% in 2010-11 and 83.1% in 2011-12.[23].

In the present study female's participation in blood donation 6.2% which is alike to the Indian's data of 6% [20]. Many studies in Africa Reported a male dominance in blood donation programs (71.2% In Burkina Faso) and (90% In Ghana) [24-25]. Our results are also in agreement with the report from other parts of India which indicated that female gender is less disposed to blood donation [26]. While in higher representation of Female Blood Donors was observed from developed countries; 40% of the blood donor population in Austria, 49.7% in France, 50% in Norway and 55% in Great Britain [27].

Overall prevalence of HIV in the study is 0.10%, which is similar to studies by Mathai et al in Kerala [28], and Chandra et al in Uttar Pradesh [29] while study reported by Ramanamma et al in Vishakhapatnam [30] and Kulkarni et al in Mumbai [31] showed higher prevalence in their respective study. In the present study, HIV prevalence showed decline pattern (Table No.2 & Fig No.7) as it was 0.16% in 2008 than there was a substantial decrement in the prevalence i.e. up to 0.07% in between the years from 2009 to 2016. However it was 0.1% in 2017 that is because of higher positivity was reported only from one center. Linear decline is also shown in Figure No. 7. Higher cases of HIV were reported in some districts of Madhya Pradesh that is because of the fact that larger donation was reported from that area.

Despite being home to the world's third-largest population suffering from HIV/AIDS (With South Africa and Nigeria having more), The AIDS prevalence rate in India is lower than in many other countries. In 2014, India's AIDS prevalence rate stood at approximately 0.26% — the 90th highest in the world [32]. The spread of HIV in India is primarily restricted to the **Southern and North-Eastern** Regions of the country and India has also been praised for its extensive Anti-Aids Campaign [33]. Low literacy level and migration is one of the major causes of HIV infection in these regions. The Indian Government has organized rigorous campaigns against AIDS along with numerous awareness and educational programme throughout the country which is responsible for the decrease in prevalence rate of HIV infection in the past 10 years. HIV Infection Has a high prevalence rate in Sub-Saharan Africa with a prevalence of 17.9%. South Africa has the highest epidemic of any country, the remaining countries in Southern Africa has a prevalence rate of 10-15% [34]. Multiple partners, unemployment and labor migration are considered the major causative factors of the high prevalence rate of HIV Infection in this area [35, 36].

Countries such as **Afghanistan** and **Cape Verde** are reported to have the lowest prevalence of the disease i.e. less than 0.1% of their populations [37]. The low prevalence of HIV in general populations of Middle East And North Africa has been attributed in part to the region's religious and cultural norms, which discourage premarital sex, encourage faithfulness within marriage, and include the universal practice of male circumcision.

V. Conclusion:

From the present study it can be concluded that there is an increasing trend in blood donation specifically voluntary blood donation with a male predominance. It can also be seen from the above data that there's a strategically fall in the prevalence of HIV infection in the past decade i.e. from 2008-2017 which is due to the various awareness, educational programs and campaigns run by the Government of India And more work has yet to be done in this field.

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Consent:

The author(s) declare that written informed consent was obtained from the patients before being recruited for this research.

Ethical Approval:

All authors(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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