

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

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Abstract: Introduction: Hepatitis B is a viral infection that attacks the liver and can cause both acute and chronic disease. The virus is transmitted through contact with the blood or other body fluids of an infected person. An unsafe blood transfusion is not only affecting the recipients themselves but also for their families, their communities and the wider society. **Aims and Objectives:** Present study is aimed to know the prevalence of HBV among the blood donors in Madhya Pradesh, a central state of India. **Materials & Methods:** Present study is a retrospective analysis of medical records at MPSACS Bhopal of the blood donors who donate their blood at NACO supported blood banks, Madhya Pradesh, India. Blood units were collected and screened for HbsAg at different blood banks of Madhya Pradesh from January 2008 to December 2017 (10 years) were included in the study. With the permission of MPSACS, last ten years data of HbsAg 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:** Blood from 2404582 apparently healthy donors aging 18-65 years was collected during the study period. Male to Female donor's ratio was 93.8% and 6.2% ($p = .000001$) where 87.1% were voluntary blood donors and 12.9% were relative blood donors ($p = .000001$). Out of screened donors, 32372(1.34%) were reactive and 2372210 (98.66%) were non-reactive for HbsAg. Prevalence of HBV in the study was 1.34%, statistically significant ($p = .000001$). **Conclusions:** A low prevalence of HBV (1.34%) was reported in the study amongst the blood donors in Madhya Pradesh. It may be due to better Health services in the state.

Keywords: Hepatitis B Virus, Blood Donors, Transfusion Transmitted Infections.

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I. Introduction

HBsAg is the surface antigen of the hepatitis B virus (HBV). It indicates current hepatitis B infection [1]. It is commonly referred to as the Australia Antigen because it was first isolated by the American research physician and Nobel Prize winner Baruch S. Blumberg in the serum of an Australian Aboriginal person [2]. Infection with the hepatitis B virus (HBV) accounts for a significant portion of morbidity and mortality worldwide [3]. Hepatitis B is a viral infection that attacks the liver and can cause both acute and chronic disease. The virus is transmitted through contact with the blood or other body fluids of an infected person [4]. Globally, more than 780 000 people die every year due to the acute or chronic consequences of hepatitis B [5]. Based on the prevalence of hepatitis B carrier state in the general population, countries are classified as having high (8% or more), intermediate (2-7%), or low (less than 2%) HBV endemicity. India is at the intermediate endemic level of hepatitis B [5]. Hepatitis B is a major health problem in India. India with a population of more than 1.25 billion has more than 37 million HBV carriers and contributes a large proportion of this HBV burden. [6]. Estimates indicate that annually over 100,000 Indians die due to illnesses related to HBV infection. HBV is reported to be responsible for 70% of chronic hepatitis cases and 80% of cirrhosis of liver cases [7]. Many cases of HBV infections in adult populations were found to be associated with blood transfusions as HBV is infective through blood and body-fluid, including vertical transmission [8].

Blood transfusion is a life-saving intervention that has an essential role in patient management within health care systems [9]. Unfortunately, blood transfusion is not without risks and may lead to the transmissions of infectious agents from donor to recipient includes; hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), syphilis-caused by *Treponema pallidum* and malaria parasite [10] and are grouped as transfusion transmitted infections (TTIs). An unsafe blood transfusion is very costly for both human and economic point of view. Morbidity and mortality resulting from the transfusion of infected blood have far reaching consequences, not only for the recipients themselves but also for their families, their communities and

the wider society [11, 12]. The economic cost of the failure to control the transmission of infection includes increase requirement for medical care, higher level of dependency, loss of productive labour force and placing heavy burden on already overstretched health and social services on national economy [12, 13]. 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 [14]. The diagnosis of HBV infection requires the evaluation of the patient's blood for hepatitis B surface antigen (HbsAg), hepatitis B surface antibody (HBsAb), and hepatitis B core antibody (HBcAb) [15].

Aim of this study is to estimate the sero-prevalence of HBV among the voluntary and relative donors over a period of ten years at blood banks of Madhya Pradesh with collaboration of Madhya Pradesh State AIDS control Society (MPSACS) Bhopal, India. The observations were also compared with the other relevant studies in India and abroad.

II. Materials and methods

In the present study, data was collected from NACO supported Blood Banks and compiled at Madhya Pradesh state AIDS Control society (MPSACS) Bhopal, India. 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). 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 HBV and other Transfusion transmitted diseases. Tests were performed with commercially available HBV ELISA kits- III generation and on and off rapid card were also used for detection of HBV 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. Last ten years data of blood donors and their HBV status in Madhya Pradesh was collected, retrieved, tabulated, summarized and compared statistically by frequency distribution and percentage proportion at Madhya Pradesh AIDS Control Society Bhopal. Here by 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.

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 as reported in our previous study Yadav et al 2018 [16], statistically significant ($p=0.000001$) (Figure 1).

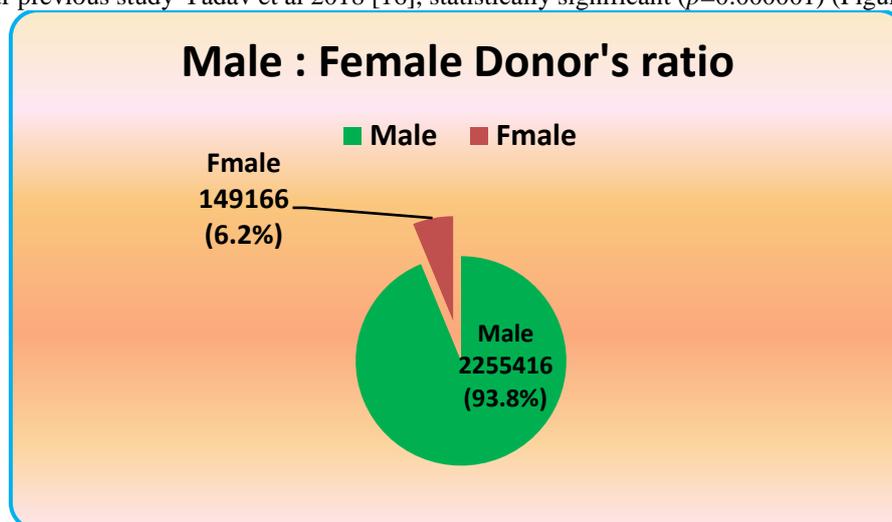


Figure no1: male :female ratio in the study

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) as reported in our previous study Yadav et al 2018 [16].

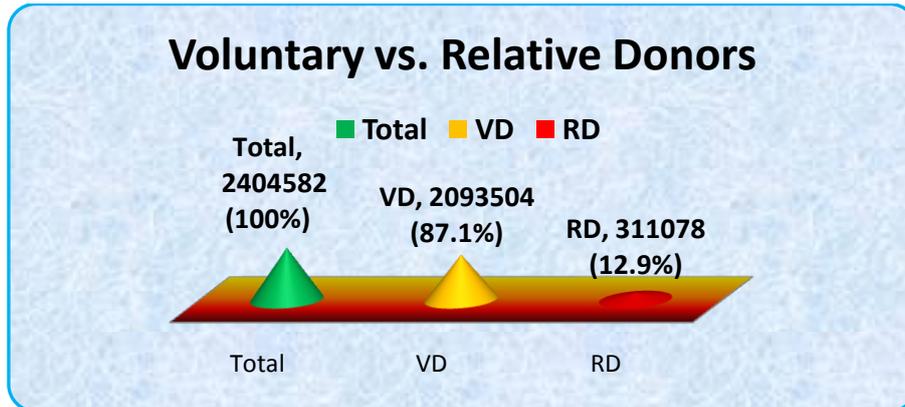


Figure no.2 Voluntary vs. relative Donors in the study

Increasing pattern in blood donation from the year 2008 to 2017 was shown in Figure No. 3 as reported in our previous study Yadav et al 2018 [16].

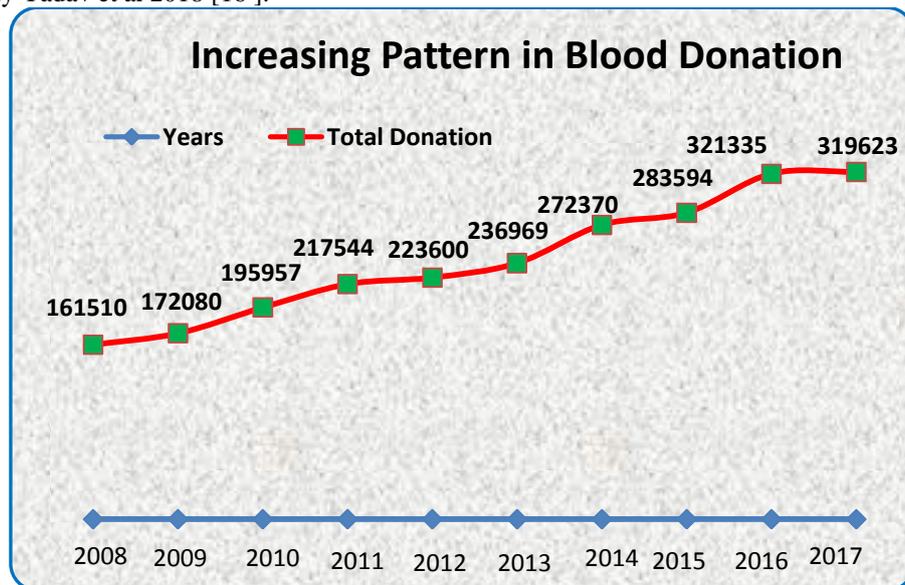


Figure no.3: Increasing pattern in Blood Donation in the study

An increasing trend in Voluntary blood donation was also reported in the study from the year 2008 to 2017 shown in Figure No. 4 as reported in our previous study Yadav et al 2018 [16], statistically significant ($p < 0.05$)

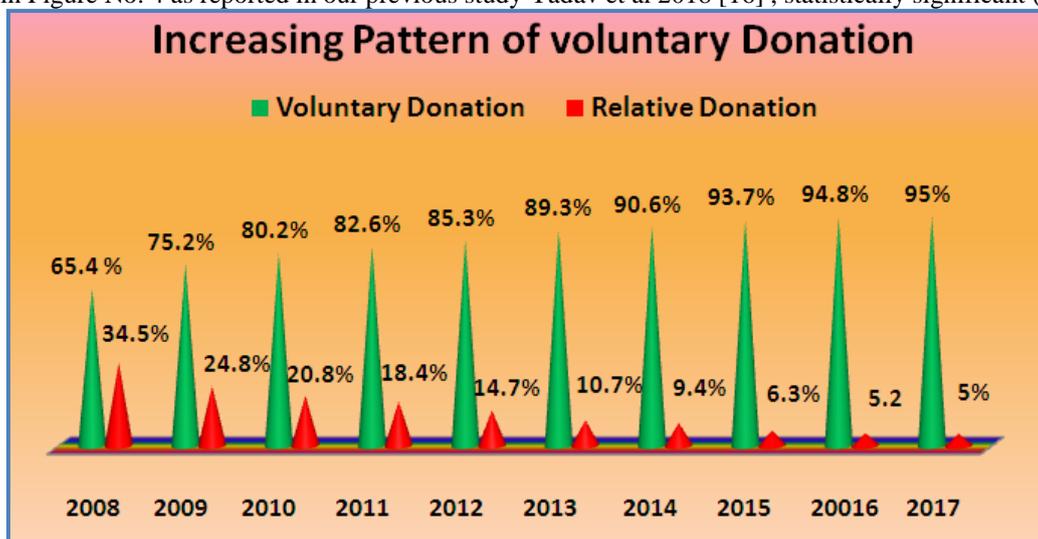


Figure no 4. Increasing pattern of Voluntary blood donation

Out of **2404582** blood units/ (Blood donors) tested for HbsAg, **32372** (1.34%) were positive while 2372210 (98.66%) were negative. HbsAg prevalence in the study was **1.34%**, statistically significant ($p=0.000001$) (figure No. 5).

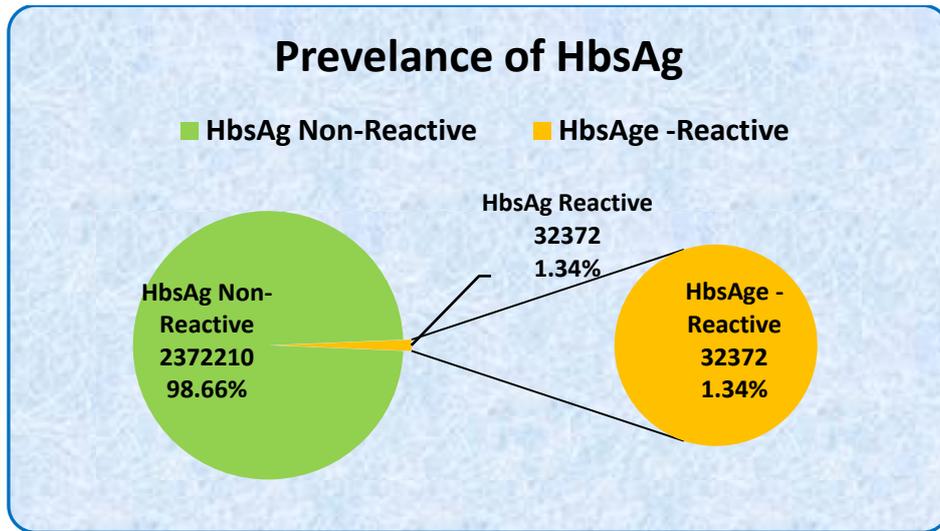


Figure no 5: Prevalence of HBV in the study period

Yearly distribution of sero-positive cases of HbsAg and its prevalence in the present study from 2008-2017 was shown in Table No.1 and figure No. 6 respectively, statistically significant ($p=0.000001$).

Table no1: Yearly prevalence of HbsAg (Year 2008 to 2017)

S.NO.	Year	Total Donors	HbsAg Reactive	Percentage (%)	P value
1	2008	161510	2457	1.52	$P= 0.000001$
2	2009	172080	2838	1.64	$P= 0.000001$
3	2010	195957	3178	1.62	$P= 0.000001$
4	2011	217544	3357	1.54	$P= 0.000001$
5	2012	223600	3565	1.59	$P= 0.000001$
6	2013	236969	3285	1.38	$P= 0.000001$
7	2014	272370	3213	1.17	$P= 0.000001$
8	2015	283594	2930	1.03	$P= 0.000001$
9	2016	319623	3677	1.15	$P= 0.000001$
10	2017	321335	3872	1.20	$P= 0.000001$
	Total	2404582	32372	1.34	$P= 0.000001$

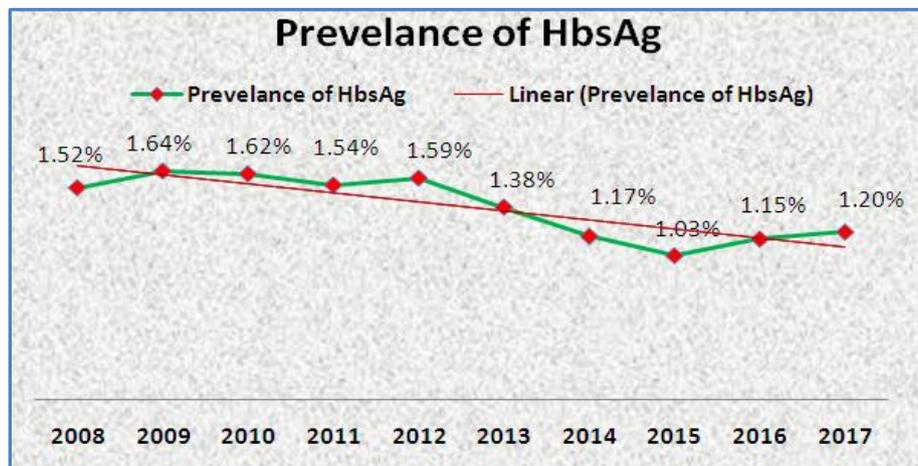


Figure no 6: Decreasing pattern in prevalence of HbsAg in the study
Geographical distribution of HbsAg cases in Madhya Pradesh was shown in figure no.7.

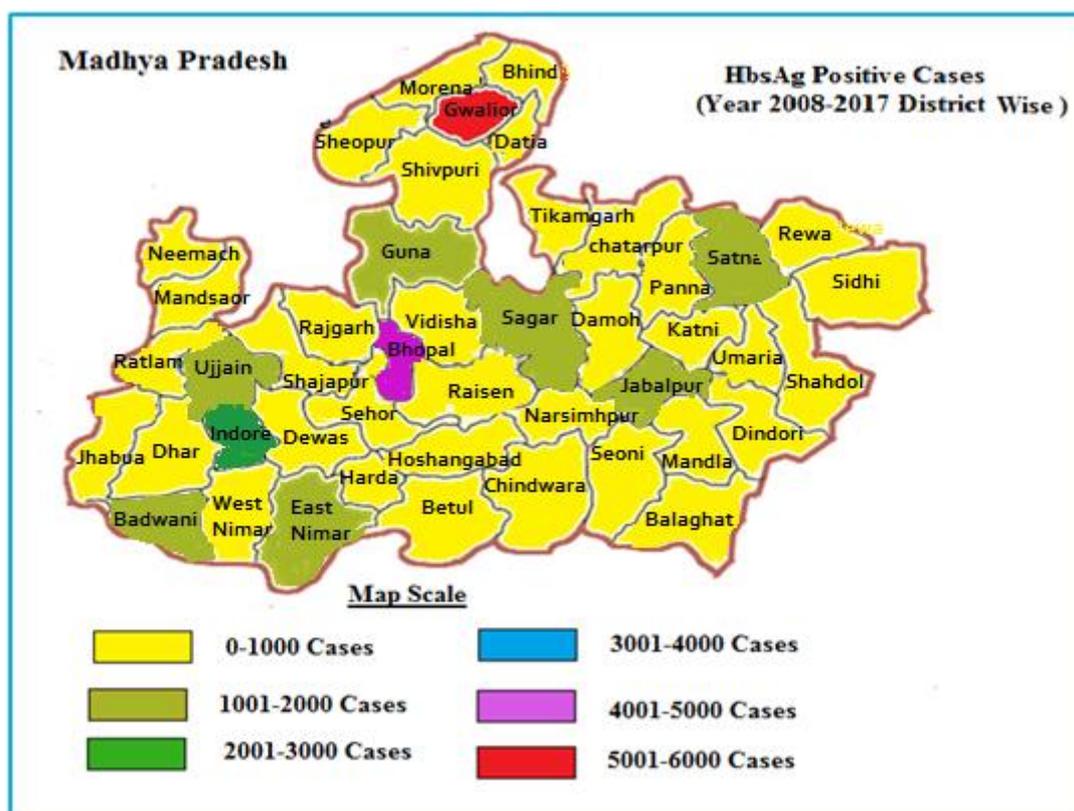


Figure no 7. Geographical distribution of HbsAg cases in Madhya Pradesh

IV. Discussion

Transfusion of blood and blood components is a life saving measure but at the same time it is an important mode of transmission of infections to the recipient. In developing countries the prevalence of TTIs amongst blood donors is much higher and quite far from attending a zero risk level at the present moment [17]. In the present study It is obvious from the result that blood donation is male dominated; male 93.8% (2255416) verses female 6.2% (149166) is further strengthen the results of study carried out at Gwalior, Madhya Pradesh by Sharma et al 2016[18]. It is because of the facts that larger populations of females in India are usually underweight and anaemic as per the donor's selection criteria. Many studies in Africa reported a male dominance in their blood donation programs (71.2% in Burkina Faso) and (90% in Ghana) [19, 20]. Our results are in agreement with previous report among blood donors in India which indicated that female gender is less disposed to blood donation [21]. While in developed countries females blood donation is much higher (Reported in 2003) than developing countries ; 40% of the blood donor population in Austria, 49.7% in France, 50% in Norway , 55% in Great Britain [22]. Greece and Italy is about 33% [23], in Spain, 46% of the blood donors are women [24], in Portugal 43% [25], in Belgium 45.4%, [26] in the Netherlands 50% [27], in France 50%, [28] and in Finland 55% [29].

In the present study out of 2404582 donations, voluntary blood donation 87.1% (n=2093504) and relative donation is 12.9% (n=311078). There's steep rise in the voluntary donation reported in the present study from the year 2008 to 2017; 65.4% in 2008 and 95% in 2017 where as national data is 52% [30]. Increase in voluntary donation in Madhya Pradesh may due to better implementations of the notional programs lunched by NACO, department of Health, Government of India.

There is 1% chance of transfusion associated problems including TTIs with every unit of blood [31]. In the present study prevalence of HbsAg was 1.34% (n= 32372/2404582) where other Studies from India show variable prevalence of HBV such as Chandra T et al 2014[32] from Lucknow reported 1.59% (n=3058/192348), Arora et al 2010[31] from southern Haryana 1.7 % (n= 100/5849), Das BK et al 2011 [33] from Kolkata 1.55% (n= 58/3745), Pahuja et al 2007 [34] from Delhi 2.23% (n= 645/28956), and Pallavi P et al 2011 [35] from Mysore 1.27% (n=496/39060). Large general population-based epidemiological study by Chowdhury et al [36] from west Bengal reported HBV prevalence 2.9 % (n= 227/7653).

In the present study high prevalence of HbsAg was reported in Gwalior division of Madhya Pradesh 2.47% (n= 5778/233918) as shown in figure no. 7 while overall prevalence in the state is 1.34%. High prevalence of HbsAg 3.09% (n=2448/79162) from Medical College, Gwalior was also reported by Arya A et al

in 2017 [37]. It may be because of that, in the surrounding rural area use of common syringes is still prevailing for the medical treatment.

A very high prevalence of HBV has been reported from the tribal population in Madhya Pradesh and other parts of India. The prevalence of HBsAg in Baiga tribal population of Madhya Pradesh was 4.4% reported by Reddy PH et al [38]. Joshi et al [39] studied 11 different tribal populations of five districts of Madhya Pradesh and found HBsAg carrier rate of 2.99–21.54% among the various tribes. The point-prevalence of HBsAg in the Idu Mishmi tribe of Arunachal Pradesh, which has common ancestral roots with the Lhoba tribe of Tibet, was found to be 21.2% [40]. Very high levels of HBsAg positivity have also been reported in the tribes of Andaman and Nicobar Islands (Nicobarese tribe—23.3%, Shompen tribe—37.8%, Jarawa tribe—65%) [41,42]. The prevalence of HBsAg was seen in 5.16% in Lambada tribes in the state of Andhra Pradesh, South India [43]. The high endemicity of HBV infection in the tribal populations has been attributed to inbreeding, poor hygienic living conditions, close person-to-person contact and certain socio-culture practices that may facilitate transmission of HBV [44]. From abroad low prevalence of HBV was reported from United States 0.4% [45] and from Bahrain is 0.58% [46] while higher prevalence among blood donors was reported from northern Ghana, African continent 11.51% [47] and Burkina Faso, West Africa (13.4%) [48].

Availability of safe blood for the recipients and as well as for community is the responsibility of national transfusion services of that country and it can be achieved by vigorous and cautious screening of donors / or donated blood with laboratory screening tests. Despite of the fact that effective vaccines have been available since the 80s and vaccination has proved to confer lifelong protection against hepatitis B and was highly successful in reducing the disease burden [49] even the HbsAg prevalence in India is still high and this is because of the fact that hepatitis B vaccination is not a part of our National Immunization Programme in India [34]. Vaccination represents the cornerstone of public health measures to control / eradicate HBV, but, other public health measures, including health education and infection control measures, remain important [49]. However, we must bear in mind the hundreds of millions of already chronically infected subjects are there, and the 5% to 10% of individuals that do not respond to currently available vaccines [50].

V. Conclusions

Low prevalence of HBV (1.34%) was reported in the study amongst the blood donors in Madhya Pradesh in comparison with India's over all data. Higher prevalence was reported from Gwalior division and it may be because of unsafe therapeutic injections in the rural catchment area of the Gwalior, illiteracy regarding medical health and vertical transmission from mother to baby. Health education along with addition of hepatitis B vaccination in the National Immunization Programme is helpful to prevent disease transmission and decrease the burden of the disease in the society.

Acknowledgment

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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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