Prevalence and Trends of Hepatitis B Infection among blood donors

Running: Hepatitis B prevalence in blood donors

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Abstract

Background: The significance of blood transfusion is best captured by the phrase, *"It's not just blood-it's liquid life."* However, without proper safety measures, transfusion carries serious risks, including the transmission of highly infectious diseases. Among these, Hepatitis B virus (HBV) infection poses a major public health threat due to its high infectivity, potential for chronic infection, and severe complications. Despite the availability of an effective vaccine, HBV remains a persistent challenge in transfusion medicine, underscoring the need for stringent screening and preventive strategies. To determine the trend of HBsAg seropositivity among the blood donor population during 5 years & its prevalence among voluntary and replacement donors.

Methods: This study was conducted at a licensed blood centre of a tertiary care hospital. A retrospective review of blood donor data over 5 years was extracted. All donated blood was screened for the presence of HBsAg using commercially available ELISA kits. All repeatedly reactive samples were labelled seropositive. The data was analysed for the trends in prevalence of HBsAg over the study period.

Results: A total of 18,139 healthy donors were screened during the study period. Among them, 11,517 were replacement donors and 6,622 were voluntary donors. The overall prevalence of HBsAg seropositivity was 0.66%, which was more in replacement blood donors (0.46%). Also, we found a decline in the incidence of HBsAg among donors over the five-year study duration.

Conclusion: To conclude, promoting and encouraging voluntary blood donation is a simple and effective way to reduce the prevalence of all transfusion-transmitted Infections.

Keywords: Blood transfusion, Hepatitis, Seroprevalence

Introduction

The importance of blood transfusion can be described by the phrase "It's not just blood, its liquid life". Its rightly said as there is no veritable substitution for blood and plays an important role in supportive care of the patients. But it has its own risks if blood safety is not ensured. Transmission of infections is one such risk factors (1). Viral infectious agents such as Hepatitis B Virus (HBV), hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) are of the greatest concern. Among which Hepatitis B infection is highly contagious, transmitted by exposure to infected blood and body fluids, sexual intercourse and maternofetal transmission (2). Inspite of the availability of effective vaccine against Hepatitis B virus, this remains a major public health concern due to its high infectivity, chronicity and mortality.

In July 2022, Centre for Disease Control reported that approximately 296 million people who are chronically infected with Hepatitis B, including 6 million children under the age of three years and also contributing to approximately 8,20,000 deaths every year.25% of chronic hepatitis B infection progress to liver cancer (3). The prevalence of these viral infections among blood donors shows a wide range of variation among different geographic areas (2). According to World Health Organization (WHO), the prevalence of HBV among blood donors in different parts of the world varies from 0.008% to 6.08% (2,4).

Donor screening strategies and the prevalence of risk factors in the society accounts for the variation in prevalence rates with time. Currently, the incidence of HBV infection through blood transfusion is relatively low as screening of blood for Transfusion Transmitted Infections (TTI) is the highest priority. But the residual risk of HBV transmission is associated with preseroconversion window period and presence of occult HBV infection which is characterised by the absence of detectable Hepatitis B Surface Antigen (HBsAg) (5,6). The global incidence of occult hepatitis among blood donors ranges from 0.006 % to 17.2% (7).

The high demand for blood transfusion warrants continuous monitoring of the magnitude of transfusion transmitted infections in blood donors (2). The screening of TTI's in blood centres not only reduces the risk of HBV transmission through transfusion but also gives a clue about the prevalence of infection in the healthy population.

The present study was conducted to determine the trend of HBsAg seropositivity among the blood donor population during 5-year period and to demonstrate the difference in prevalence of HBsAg among voluntary and replacement donors. Replacement donors are one time blood donors who donate blood only when a relative is in need of blood.

Methods

This study was conducted at a licensed blood centre of a tertiary care hospital in Bengaluru, India. A retrospective review of blood donor data from January 2018 to December 2022 was extracted. The annual total blood donors with types of blood donors were classified into voluntary and replacement donors. All donated blood was screened for the presence of HBsAg using commercially available Enzyme-Linked Immuno Sorbent Assay (ELISA) kit (Qualisa, Microwell Enzyme ImmunoAssay, Qualpro Diagnostics,India). All initially positive samples were retested and the repeatedly reactive samples were labelled seropositive. According to National Blood Transfusion Commitee policy, positive blood units were discarded and donors were recalled for counselling and treatment. The data was analysed for the trends in prevalence of HBsAg. Ethical committee clearance certificate was obtained from the Institutional Ethical Committee (Ref.no.IEC/A-32/23) before the start of the study according to the Principles of Declaration of Helsinki.

Results

A total of 18,139 apparently healthy donors were screened during the study period. Among them 11,517 were replacement donors and 6622 were voluntary donors (Table 1 and Graph 1). The overall prevalence of HBsAg seropositivity was 0.66% (Table 2). The distribution of HBsAg seropositivity among replacement and voluntary donors was 85 and 36, respectively as depicted in graph 3. The predominant age group of seropositive donors are as shown in Figure 1 with predominance in the age group of 20 to 40. The trends in the seroprevalence of HBsAg during a five-year period are shown in graph 2 depicted a decline over the 5 years study period from 0.83% to 0.5%. The lowest seroprevalence was noted in 2022. The annual variation of HBsAg seroprevalence among replacement & voluntary donors are depicted in Graph 3.

Discussion

Viral hepatitis is one of the serious complications of blood transfusion caused most commonly by the hepatitis B and hepatitis C virus. Humans are the only reservoirs of hepatitis B virus.HBV is a DNA virus first discovered by Blumberg et al in 1965 in the serum of an Australian aborigine (8).

To reduce the risk of transfusion-transmissible diseases, WHO recommends mandatory blood screening before transfusion (7). The risk of TTI has declined dramatically in developed countries over the last two decades. However, blood screening in the developing countries like India largely depends on ELISA which targets only HBsAg and cannot detect occult Hepatitis, continuing the risk of transfusion transmitted Hepatitis B infection. In the recent years, National Viral Hepatitis Control Programme has been initiated under the National Health Mission of India, for prevention and control of viral hepatitis with a view to provide free of charge screening, diagnosis, counselling and appropriate treatment, specially to the people belonging to high-risk groups. Recent advances in diagnostics have now made it possible to diagnose Hepatitis infection through point of care diagnostic kits. Several new technologies and platforms are also now available for conducting confirmatory tests through viral load testing (9).

The overall seroprevalence of HBsAg in our study was 0.66%. This was comparable to studies done by Singh et al (0.62%) (10) and Dhruva G A et al (0.97%) (11). However, higher prevalence was noted in studies done in Rajasthan (3.44%) (12) and in Delhi (2.22%) (13) (Figure 2) While the prevalence in other geographic areas is tabulated in table 4. All the studies done across India show higher prevalence of HBsAg among replacement donors as replacement method of blood collection was being widely practiced till recent years. The variation in prevalence among different studies are probably due to differences in social behaviour, lifestyle, socioeconomic status, immunisation status and the level of awareness regarding the infection.

The majority of donors (63%) in our study were replacement donors. Replacement donors are one time blood donors who donate blood only when a relative is in need of blood. While voluntary donors are motivated blood donors who donate at regular intervals.Studies have shown that replacement donors constitute the largest group of blood donors in India, (14-16) reflecting lack of public awareness. For the same reason, incidence of HBsAg seropositivity was higher in replacement donors(0.46%).Similar finding was noted in studies by Eko Mba et al (7.4%), (1) Fessehaye N et al (2.99%), (15)Durro et al (8.6%) (6) and Dhruv G A et al (0.8%) (11) as tabulated in table 4.However in studies done in Iran and Ethiopia there was no practice of replacement donation which contributed to comparatively lower prevalence of HBsAg seropositivity (2, 14).

However, the trends in HBsAg seropositivity has effectively declined from 2018 to 2022 (Figure 2) which can be attributed to the significant reduction in the number of replacement

donors. The declining trends may be due to public awareness created by conduction of blood donation camps. The voluntary blood donors mainly consisted of students, religious groups and voluntary organisations. Also, National Blood Transfusion Committee of India has implemented strict donor selection criteria and proper counselling of blood donors contributing to significant decline in prevalence of HBsAg among blood donors (9).
Similar decreasing trend has been reported in previous studies by Pallavi et al, India (16) Farshadpour F,Iran (2) Ahmed et al, Pakistan (17) Abdullah S, Saudi Arabia, (18) Okoroiwu, Nigeria (19). Despite these improvements, zero residual risk transmission of HBsAg is a long way ahead especially in developing countries, due to difficulties in the implementation of Nucleic Acid Amplification Test (NAT) or Polymerase Chain Reaction (PCR) as screening tests.

Conclusion

Our study shows declining trend and prevalence of HBsAg seroprevalence among blood donors which is an encouraging sign showing the effectiveness of strict donor selection criteria, conduction of blood camps and use of sensitive screening tests. Though seropositivity can be further reduced by implementing NAT and PCR, these diagnostic tests are financially and technically beyond reach in developing countries like India. To conclude, promoting and encouraging voluntary blood donation is a simple and effective way to reduce the prevalence of all transfusion-transmitted Infections.

Acknowledgement

We extend our gratitude to The Institution and the blood centre staff for their invaluable contribution to the study.

Funding sources

None

Ethical statement

Permission obtained from the institutional ethics committee.

Conflicts of interest

None

Author contributions

Yashica Gowda R & Suja Ajoy kumar conceived of the presented idea. Yashica Gowda R and Karthik Srevatsa verified the analytical methods. Suja Ajoy kumar encouraged to investigate and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request

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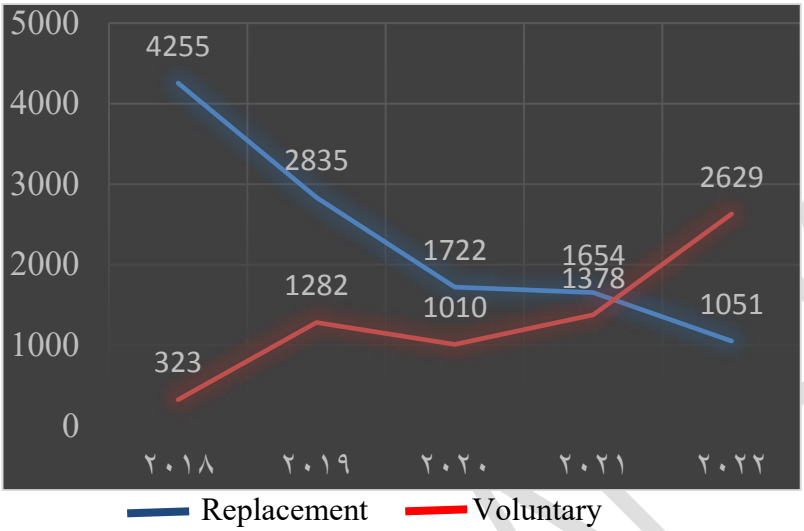
Table 1. Distribution of total blood donor population

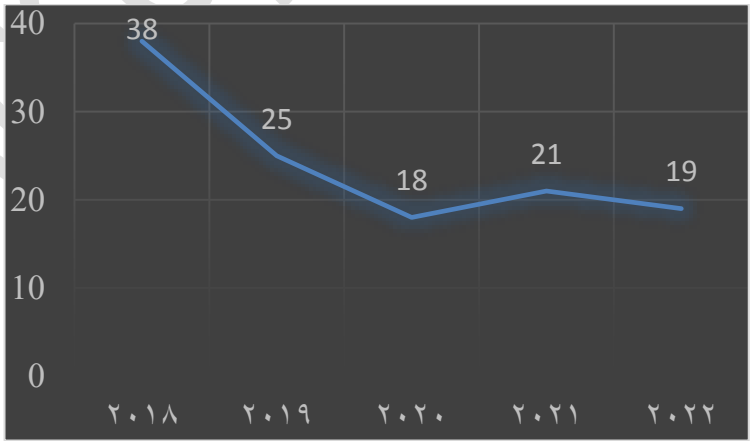
No. Of donors	Year					Total
	2018	2019	2020	2021	2022	
Total	4578	4117	2732	3032	3680	18,139
Replacement	4255	2835	1722	1654	1051	11,517
Voluntary	323	1282	1010	1378	2629	6,622



Graph 1. Trend in the distribution of total blood donor population

Table 2. The year wise prevalence of HBsAg seropositivity during the study period

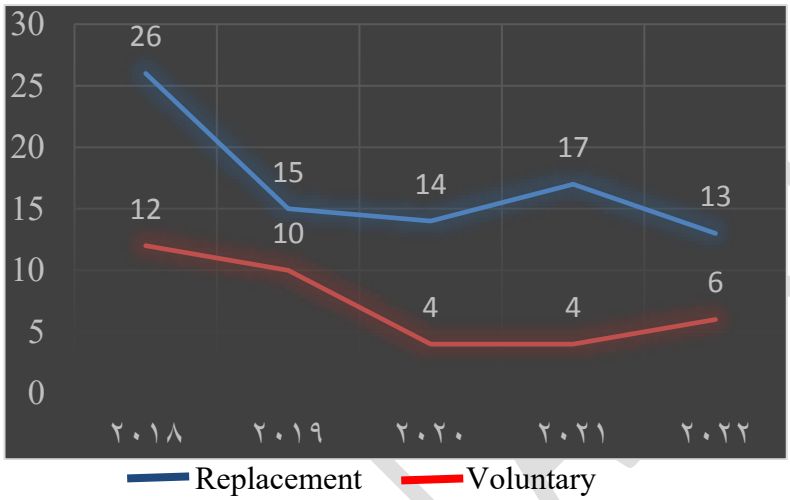
Year	HBsAg seropositivity
2018	38 (0.83%)
2019	25 (0.6%)
2020	18 (0.65%)
2021	21 (0.69%)
2022	19 (0.51%)
Total	121 (0.66%)



Graph 2. Trend in the year wise prevalence of HBsAg seropositivity during the study period

Table 3. The distribution of HBsAg seropositivity among replacement and voluntary blood donor populations.

Donors	Year					Total
	2018	2019	2020	2021	2022	
Replacement	26 (0.56%)	15 (0.36%)	14 (0.51%)	17 (0.56%)	13 (0.35%)	85 (0.46%)
Voluntary	12 (0.26%)	10 (0.24%)	4 (0.14%)	4 (0.13%)	6 (0.16%)	36 (0.33%)



Graph 3. The distribution of HBsAg seropositivity among replacement and voluntary blood donor population.

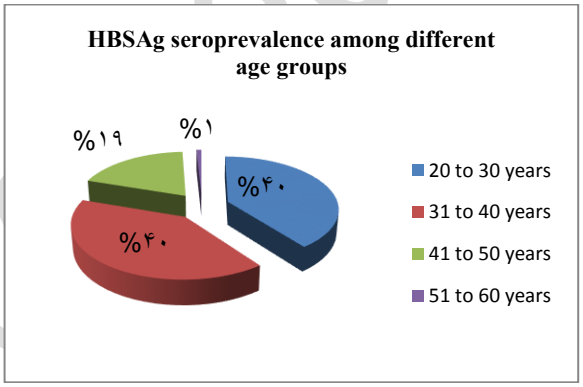


Figure 1. Age distribution among HBsAg seropositive blood donors

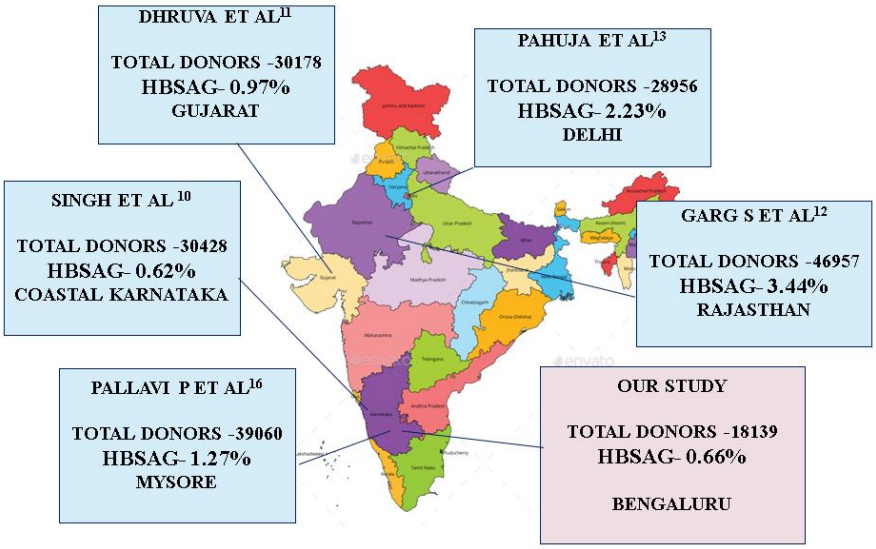


Figure 2. Comparison of our study with other studies across India

Table 4. Comparison of our study with other studies across the globe.

Sl.no	Study	Country	Total donors	HBsAg seropositivity (%)	Voluntary donors (%)	Replacement donors (%)
1	Our Study	India	18139	0.66	0.03	0.46
2	Eko Mba et al .(1)	Gabon	69862	7.28	6.37	7.28
3	Igezu H et al .(14)	Ethiopia	359	3.60	3.60	0
5	Fessehaye N et al (15)	Eritrea	29501	2.58	2.47	2.99
6	Farshadpour F et al (2)	Iran	293454	0.15	0.15	0
7	Durro et al (6)	Albania	79274	7.90	8.10	8.60
8	Dhruv G A et al (11)	India	30178	0.97	0.40	0.80
9	Pallavi P et al (16)	India	39060	1.27	1.22	1.23