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Seroprevalence of HBV and HCV among Healthy Blood Donors in a Tertiary Care Hospital of Northeast India: a 5-year Retrospective Study

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A B S T R A C T

Presence of hepatitis B virus (HBV) and hepatitis C virus (HCV) in blood donors poses a risk of transmission through blood transfusion. Chronic HBV and HCV infections put people at high risk of diseases with high morbidity and mortality. We wanted to estimate the seroprevalence of these infections in Northeast India by undertaking a study on the healthy blood donors. In a retrospective study we reviewed the records of blood donors from 2009 to 2013. The donors were screened for HBsAg by MICROSCREEN ELISA TEST KIT, Span Diagnostic Ltd and for anti-HCV by SD HCV ELISA 3.0, SD Bio Standard Diagnostics Pvt. Ltd respectively. A total of 136,116 donations were received, comprising of 60.92%voluntary donors and 39.07% replacement donors. 94.08% were males and 5.32% were females. The overall prevalence of HBsAg and anti-HCV positive blood donors was 0.77% and 0.37% respectively. The prevalence rates were higher in the replacement donors compared to the voluntary donors ($p < 0.0001$). There was decreasing trend in the yearly rates of seroprevalence. This study gives a crude estimate of the prevalence of HBV and HCV infections in the apparently healthy population of Northeast India.

Introduction

Hepatitis B and Hepatitis C are issues of global importance. Chronic HBV and HCV infections put people at high risk of fatality from liver cirrhosis and cancer. Laboratory diagnosis of HBV infection focuses on the detection of HBsAg. HCV infection is diagnosed by screening for anti-HCV. It is confirmed by detection of HCVRNA. The World Health Organization (WHO) recommends that all blood donations are tested for HBsAg and anti-HCV to avoid accidental transmission. An estimated 257 million and 71 million people are living with HBV infection and chronic HCV infection, respectively. In the Indian subcontinent, an estimated 2–5% of the general population is chronically infected with HBV (WHO Hep B fact sheet, 2017; WHO Hep C fact sheet,2017).Based on few population-based

studies, the prevalence of HCV infection in India is 0.09-2.02% (Mukhopadhyaya *et al.*, 2008). In this study we attempt to estimate the prevalence of HBV and HCV infection in northeast India by a retrospective study of healthy blood donors.

Materials and Methods

This study was conducted by the Microbiology Department of Gauhati Medical College and Hospital, Guwahati, Assam. We reviewed the records of healthy blood donors (age group 18 – 60 years) in the model blood bank of our hospital retrospectively from January 2009 to December 2013.

This blood bank caters to the need of most of the patients of the districts of lower Assam. The donors were selected by trained personnel after completing a standard questionnaire and thorough physical examination. They were grouped into two types: 1. replacement donors (family members or friends of the patients) and 2. Voluntary donors (people who donate blood in camps or who donate blood without expecting any favour).

The donors were screened for HBsAg by MICROSCREEN ELISA TEST KIT, Span Diagnostic Ltd. and for anti-HCV by SD HCV ELISA 3.0, SD Bio Standard Diagnostics Pvt. Ltd., respectively. Both these kits are licensed for the use in blood banks in India (blood bank guidelines, CDSCO).In a study assessing the performance characteristics of various kits for Hepatitis B and C, the kits by J. Mitra and Co Pvt. Ltd. had 100% sensitivity and 100% specificity and the kits by SPAN Diagnostic Ltd., had 100% sensitivity and 98.7% specificity (Maity *et al.*, 2012).

The prevalence was calculated based on the number of donations tested and number of donations with positive results in screening tests. Comparisons of prevalence rates in voluntary and replacement donors were carried out using Chi-square test. A significance criterion of $p \leq 0.05$ was used in the analysis.

Results and Discussion

There were 136,116 healthy blood donors, comprising of 128,064 (94.08%) males and 8052 (5.92%) females. There were 82,929 (60.92%) voluntary donors and 53,187 (39.07%) replacement donors (Figure 1). HBsAg was detected in 1049 (0.77%) donors. Anti-HCV was detected in 504 (0.37%) donors (Table 1).

The prevalence rates of HBV and HCV were significantly higher in the replacement donors (Figures 2 and 3). There was a decreasing trend in the prevalence rates of these infections (Figure 4).

Due to non-feasibility of carrying out large scale population based studies, several authors have tried to estimate the prevalence of HBV and HCV infections in the population by carrying out studies in the healthy blood donors. As WHO mandates checking of HBV and HCV infections in donated blood products prior to transfusion, this is a practical but very crude method of estimating the prevalence. We carried out this retrospective study because of lack of such prevalence studies in this part of northeast India.

We found a lower prevalence of HBV and HCV infections in healthy blood donors than those reported in previous comparative studies from other parts of India (Sonwane *et al.*, 2003; Arora *et al.*, 2010; Meena *et al.*, 2011). Similarly, two studies fromother parts of northeast India showed lower prevalence rates of these infections in healthy blood donors (Dowerah S *et al.*, 2017; Rahman S *et al.*, 2016) (Table 2).

Table.1 Year wise prevalence of HBsAg positive and anti-HCV positive blood donors

Year	Donors	HBsAg		Anti-HCV	
		n (%)	95% CI	n (%)	95% CI
2009	24624	264 (1.07)	(0.94,1.20)	279 (1.13)	(1.00, 1.26)
2010	24223	208 (0.86)	(0.74, 0.98)	80 (0.33)	(0.26, 0.40)
2011	28242	181 (0.64)	(0.55, 0.73)	64 (0.23)	(0.18, 0.28)
2012	29409	184 (0.62)	(0.53,0.71)	37 (0.13)	(0.09, 0.17)
2013	29618	212 (0.71)	(0.61,0.81)	44 (0.15)	(0.11. 0.19)
Overall	136116	1049 (0.77)	(0.72, 0.82)	504 (0.37)	(0.34, 0.40)

Table.2 Comparative studies on the seroprevalence of HBV and HCV in blood donors

Study	Place	Year	HBsAg (%)	Anti-HCV (%)
Sonwane BR *et al.*, 2003	Ambajogai, Maharashtra	1996-2001	4.07	-
Arora D *et al.*, 2010	Hisar, Haryana	2002-2006	1.70	1.00
Meena M *et al.*, 2011	New Delhi, Delhi	2005-2009	1.43	0.57
Present study	Guwahati, Assam	2009-2013	0.77	0.37
Dowerah S *et al.*, 2017	Dibrugarh, Assam	2012-2014	0.39	0.10
Rahman S *et al.*, 2016	Jorhat, Assam	2013-2016	0.57	0.42

Figure.1 Type of blood donors in the study

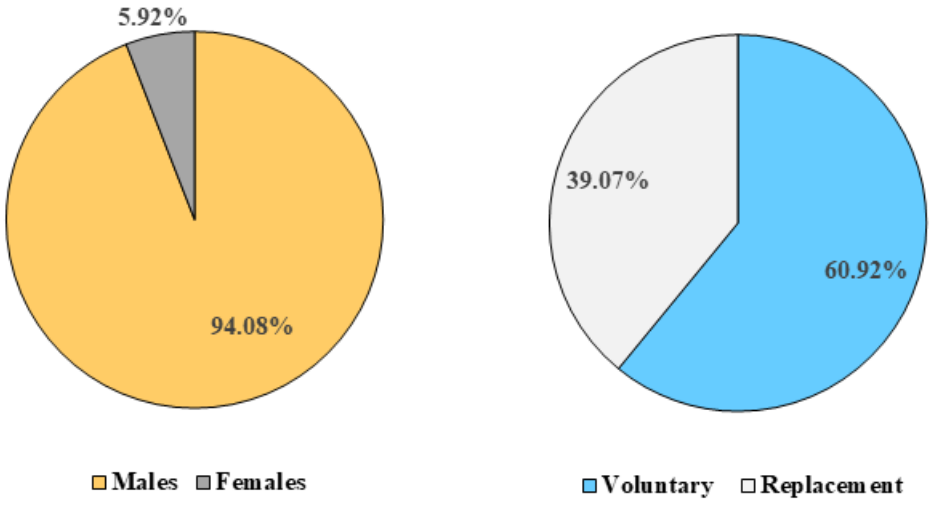


Figure.2 Seroprevalence of HBV in relation to donor type

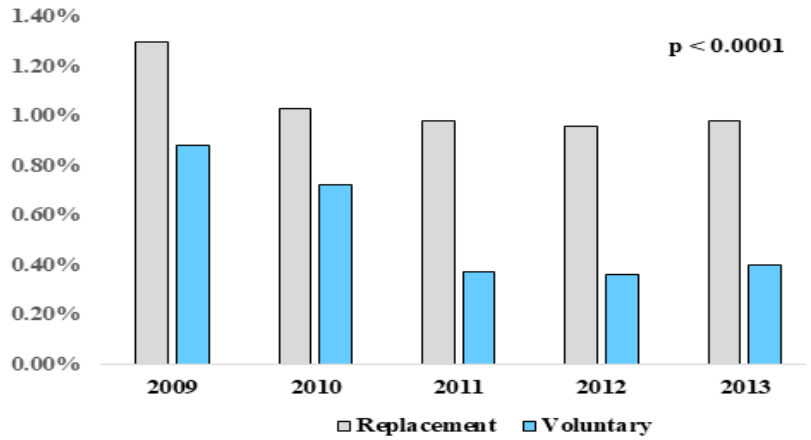


Figure.3 Seroprevalence of HCV in relation to donor type

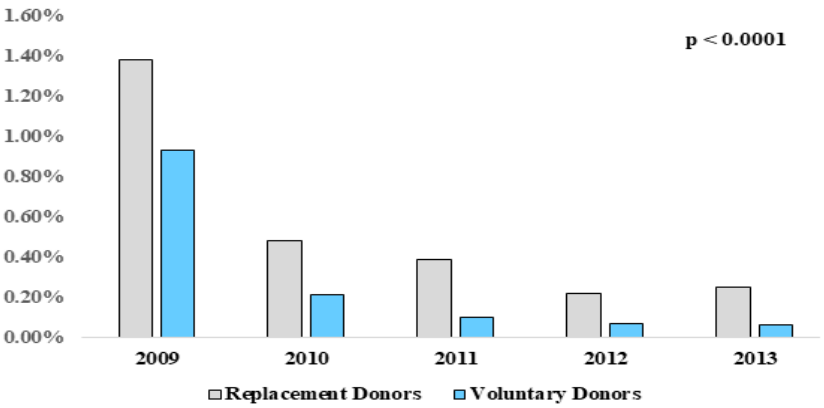
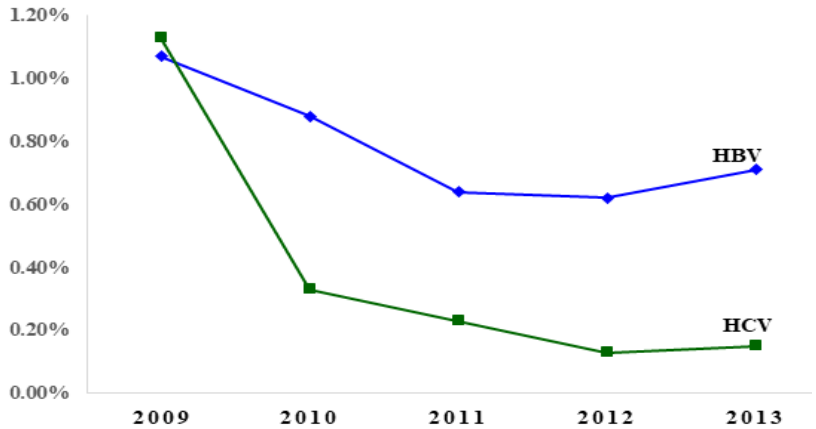


Figure.4 Trend in seroprevalence of HBV and HCV in blood donors



In the present study found that the prevalence rates of HBV and HCV infections were significantly high in replacement donors compared to voluntary donors. This has also been observed in previous studies and could be due to several factors such as concealing high risk behaviours and paid donors posing as relatives (Dowerah *et al.,* 2017; Rahman *et al.,* 2016; Makroo *et al.,* 2015; Fulzele *et al.,* 2017). There was no significant difference in the prevalence rates of HBV and HCV infections in male and female blood donors. Females formed a very small proportion of donors probably due to higher prevalence of anaemia in women.

The present investigation noted a decreasing trend in the prevalence rates of HBV and HCV infections in the donors. Though replacement donors comprised a large proportion of blood donors, there was a rise in proportion of voluntary blood donors in camps from 3.31% in 2009 to 10.08% in 2013. This rise in voluntary blood donation in camps could partly account for the decreasing trend of HBV and HCV infections in blood donors. Previously, some authors have found a consistent decreasing trend of HBV infection and slightly increasing trend in HCV infection in blood donors (Dowerah *et al.,* 2017; Rahman *et al.,* 2016; Makroo *et al.,* 2015). Introduction of hepatitis B vaccine in national immunization programmes, educational programmes and availability of resources to diagnose hepatitis in health centre may partly account for the decreasing trend.

Limitations

Study on healthy blood donors gives a very crude estimate of the prevalence of HBV and HCV infections in the population. People who are symptomatic are unlikely to donate blood and many with risk factors are screened out by the blood bank personnel. Females are under-represented as blood donors in the study. Serological markers other than HBsAg and anti-HCV have not been used. It is possible to have donors with occult HBV infection or few in window period, who lack detectable HBsAg but whose exposure to HBV infection is indicated by a positive anti-HBc and HBV DNA (Dreier J1*et al.,* 2004). Studies show high prevalence of HBV and HCV in high risk groups and closed communities from northeast India (Devi KS *et al.,* 2004; Biswas *et al.,* 2007; Phukan *et al.,* 2001). This study is therefore likely to underestimate the burden of HBV and HCV infections in the overall population.

In conclusion, the current infectious disease pattern and trends in donor population can help in planning of transfusion related health challenges in the future. Despite limitations, this study roughly gives an idea on the prevalence of HBV and HCV infections in apparently healthy population of northeast India. Encouraging female and voluntary blood donation may increase safer donor pool. There is need for improvement and implementation of strict donor selection and more sensitive screening tests to prevent inadvertent transmission of these infections.

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