Trend in seroprevalence of Hepatitis B virus infection among blood donors of coastal Karnataka, India

Karandeep Singh, Sudha Bhat, Shamee Shastry

Blood Bank, Kasturba Medical College, Manipal-576104, Karnataka, India

Abstract

Background: Hepatitis B is one of the transfusion transmissible infections. The prevalence of this infection varies across the different geographies. Noting the trend in seroprevalence is useful to assist the preventive strategies. The aim of this study was to determine the trend of seroprevalence of hepatitis B in costal Karnataka over a three-year period.

Methodology: The study was conducted at the blood bank of a tertiary care hospital serving predominantly the people of coastal Karnataka. A retrospective analysis of blood donors over a period of three years was done to assess the seroprevalence and the trend of hepatitis B infection. ELISA was used to detect the hepatitis B surface antigen in the donors as a marker of infection.

Results: A total of 30,428 blood donors were studied. 189 (0.62%) were positive, which comes under the “low prevalence (< 2%) zone” per World Health Organization (WHO) guidelines. A decreasing trend over three years was seen. Replacement donors and male blood donors showed higher seropositivity compared to voluntary donors and female donors. Chi-square test was used to calculate the significance of difference between the groups.

Conclusion: Coastal Karnataka has a low prevalence of hepatitis B in blood donors with a decreasing trend over the last three-year period.

Key Words: HBsAg, seroprevalence, blood donors


Received 25 February 2009 - Accepted 4 May 2009

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Introduction

Hepatitis B is a major public health problem worldwide. Approximately 30% of the world’s population or about 2 billion persons have serological evidence of either current or past infection with hepatitis B virus [1]. Countries are classified on the basis of endemicity of hepatitis B virus (HBV) infection into high (8% or more), intermediate (2-7%) or low (less than 2%) incidence countries. The prevalence of chronic HBV infection in India ranges from 2% to 10% as shown by different studies [1]. India therefore comes under the intermediate to high endemicity category. Hepatitis B infection is one of the transfusion transmissible infections; hence it is mandatory to test all blood donors for HBsAg. Sero-surveys are one of the primary methods to determine the prevalence of HBsAg. The assessment of the occurrence of infections in the blood donor population is made on the basis of the evaluation of the data on the prevalence of hepatitis B infection. Consequently, the assessment helps in determining the safety of the blood products. It also gives an idea of the epidemiology of these diseases in the community. In the present retrospective study, we evaluated the seroprevalence of hepatitis B virus among blood donors in coastal Karnataka. The study also aimed to determine the trend in hepatitis B infection and to compare the prevalence with that of other areas in India. The results of these prevalence studies should help in the creation of long-term strategies to improve public health and to prevent spreading of the disease in the local population.

Material and Methods

The study was conducted at the blood bank of a tertiary care hospital serving predominantly the people of coastal Karnataka. In this retrospective study we reviewed 30,428 healthy blood donors over a period of three years from January 2005 to December 2007. They were carefully selected for donation by trained personnel after a complete physical examination and satisfactorily answering the donor’s questionnaire. The family members, friends or relatives of the patients were categorized as replacement donors. People who donate blood without expecting any favor in return or in voluntary
blood donation camps were classified as voluntary blood donors. At the end of the blood collection, donor samples were obtained for serological testing. HbsAg screening was done using the commercially available Erba Lisa ELISA kit (Transasia Biomedical Ltd, Daman) with reported sensitivity of 100% and specificity of 99.9% per the manufacturer’s manual. All reactive samples were tested again using the same ELISA kit as well as a rapid test kit based on the principle of a one-step immunoassay (Hepacard, Biomed Industries, India). Samples showing repeat test reactivity on both methods were considered positive and were included for calculation of seroprevalence. The statistical evaluation of the data was made using biostatic software InStat Graphpad. The year-wise statistics were also calculated.

**Results**

Out of the total 30,428 blood donors, 28,046 (92.17%) were males and 2,382 (7.83%) were females with male to female ratio of 11.77:1. Table 1 shows that 84.43% of donors were categorized as replacement donors and the rest were voluntary blood donors. The initial screening test revealed that 226 (0.74%) donors were HbsAg reactive. On repeat testing, only 189 (0.62%) samples were positive (figure 1). The trend in seroprevalence over three years is shown in figure 2. The observed seroprevalence of HBV was higher in replacement donors than in voluntary donors (0.65% vs. 0.42%, respectively, Table 2). A higher seroprevalence rate was observed among male donors than in female blood donors (0.65% versus 0.25% respectively) and the difference is statistically significant (p value: 0.024). The majority of the seropositive donors were younger than 35 years (137 donors were 35 years of age or less, and 52 donors above 35 years).

**Discussion**

According to India’s Drugs and Cosmetics Act (1945), each blood unit has to be tested for hepatitis B virus infection [2]. In our study, among the 30,428 blood donors screened, the overall seroprevalence of HbsAg was observed to be 0.62%. According to the WHO classification, this coastal part of Karnataka qualifies as a low prevalence area (less than 2%). The data providing a picture of hepatitis B infection burden in India has come from HBsAg seroprevalence studies (Table 3). In comparison with the other parts of India, the present study shows low seroprevalence of hepatitis B infection in costal Karnataka. The present study revealed that HBV infection was more prevalent among replacement blood donors than voluntary donors as noted in the study of Sonwane et al. and Singhvi et al. [8,9]. Seroprevalence was significantly high in male donors

<table>
<thead>
<tr>
<th>Year</th>
<th>Total donors</th>
<th>Replacement</th>
<th>Voluntary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>2005</td>
<td>6,259</td>
<td>401</td>
<td>1,402</td>
</tr>
<tr>
<td>2006</td>
<td>8,026</td>
<td>532</td>
<td>1,036</td>
</tr>
<tr>
<td>2007</td>
<td>9,993</td>
<td>482</td>
<td>1,330</td>
</tr>
<tr>
<td>Total</td>
<td>25,693</td>
<td>4,735</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1. Donor category and gender distribution (age: 18-60 years)**

<table>
<thead>
<tr>
<th>Donors</th>
<th>Positive</th>
<th>Prevalence</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement</td>
<td>169</td>
<td>0.65%</td>
<td>0.072</td>
</tr>
<tr>
<td>Voluntary</td>
<td>20</td>
<td>0.42%</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>183</td>
<td>0.65%</td>
<td>0.024</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>0.25%</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Comparison of seroprevalence in various donor categories**

**Figure 1. Results of donor screening**

Total Donors (30,428)

Total HBsAg Reactive Donors: 226 (0.74%)

Positive on repeat testing: 189

Prevalence: 0.62%

Negative on repeat testing: 37
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as compared to female donors. It is to be noted that the majority of our study population were males. However, the statistical analysis (chi-square test) revealed this difference in the seroprevalence to be significant (p value -0.024). A significantly higher HBsAg seroprevalence in males than in females is also reported in other studies [7,14]. Rodenas et al. reported the higher prevalence of HBsAg in donors older than 38 years, whereas in the present study, the majority of seropositive donors were younger than 35 years [15]. The decreasing trend in seroprevalence was noticed over three successive years. The lower prevalence and decreasing trend in coastal Karnataka may be a result of several factors. First, the literacy rate in Udupi and Dakshina Kannada District is more than 80%, whereas the overall literacy rate of Karnataka state is 67% and that of India is 65% (Census of India 2001). The awareness about the disease and modes of prevention may be one reason for the low prevalence and declining trend in HBV infection. Secondly, the implementation of strict pre-donation counseling and donor selection criteria help in excluding the possibly infected donors.

The better reflection of the seroprevalence of HBV infection in this region of India may be studied in the non pre-screened samples. The absence of HbsAg in blood donors may not be sufficient to ensure the lack of circulating HBV and hence there are chances of missing occult HBV infection. These issues are the possible limitations of our study.

Ensuring the safety of patients by reducing the residual risk of transfusion transmitted hepatitis is the concern of every transfusion center. Along with advanced technology such as nucleic acid testing (NAT) for donor screening, other factors such as public awareness, educational and motivational programs, and mass immunization programs help in decreasing the infection. Pre-donation counseling, donor self-exclusion and ensuring 100% voluntary blood donation will be effective in decreasing the hepatitis B infection rate. This study provides a helpful guide in reducing the residual risk of transfusion transmitted hepatitis not only in India but also in the other developing countries of the world.

References
2. Drugs and Cosmetics Act 1940 (India).


**Corresponding Author**
Dr. Shamee Shastry, MD
Assistant Professor of Transfusion Medicine
Kasturba Medical College, Manipal-576104, India
Email: shameegirish@gmail.com

**Conflict of interest:** No conflict of interest is declared.