Epidemiological Report

Trends in Hepatitis B and Hepatitis C Seroprevalence among Nepalese Blood Donors

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SUMMARY: In Nepal, hepatitis B and hepatitis C are considerable health problems. This study aimed to assess the trends of hepatitis B virus (HBV) and hepatitis C virus (HCV) seroprevalence in blood donors over the last 6 years nationwide and in the urbanized setting of Kathmandu Valley. This was a retrospective study conducted among Nepalese blood donors through the years 2001/2002- 2006/2007. Serum samples were tested for hepatitis B surface antigen and anti-HCV antibodies using third generation ELISA tests. The donors’ information was collected via the donor record register through their respective Blood Transfusion Services. The software, Winpepi ver 3.8 was used for statistical analysis. The overall seroprevalence rates of HBV and HCV in a nationwide analysis were observed to be 0.82 and 0.47%, respectively, and at Central Blood Transfusion Service (CBTS), Kathmandu, the rates were 0.92 and 0.71%, respectively. The seroprevalence of HBV was significantly higher than the seroprevalence of HCV, both nationwide and at CBTS ($P < 0.05$). An overall significantly decreasing trend was observed in HBV and HCV seroprevalence both nationwide and at CBTS, Kathmandu, over the last 6 years ($P < 0.05$). Though the overall trend was significantly decreasing, the test for departure from a linear trend also showed a statistically significant result ($P < 0.05$).

INTRODUCTION

Hepatitis B virus (HBV) is highly infectious and can be transmitted covertly by percutaneous routes and overtly by blood transfusion. Hepatitis B surface antigen (HBsAg) in serum is the first sero-marker to indicate active HBV infection, either acute or chronic (1). HBV infection is a major global public health problem. About 2 billion people worldwide have been infected, among whom more than 350 million are chronic carriers of HBV (2). In Nepal, the seroprevalence of HBsAg has been reported to range from 0.3 to 4.0% in the general population in various studies conducted from 1990 to 2003 (3-9). Among Nepalese blood donors, HBsAg seroprevalence has been reported to range from 0.88 to 1.26% (10-12). In Nepal, the screening of blood for HBsAg was started in 1979 in Kathmandu and it is now mandatory for all Blood Transfusion Services (BTS) in the country. Recently, HBV has received increased public health attention in Nepal, and organized mass vaccination programs have been conducted in schools, clubs, communities, etc. Such activities might have a significant positive impact on reducing the prevalence of HBV in the general population and may result in a relatively lower seroprevalence of HBsAg among blood donors.

Hepatitis C virus (HCV) is transmitted mainly by parenteral routes viz. contaminated needles, transfusion of infected blood, etc. In 1997, the World Health Organization estimated a worldwide prevalence of about 3% with the virus affecting 170 million people worldwide and 3 to 4 million new infections each year (13). Among the viral hepatitis strains, HCV is especially dangerous in that its morbidity rate is high, as it establishes a state of chronic infection in as many as 85% of acutely infected patients, whereas about 15% of acutely infected patients spontaneously clear the infection (14,15). In Nepal, the seroprevalence of anti-HCV among the general population and blood donors has been reported to range from 0.3 to 1.7% (6,16-19). Among intravenous drug users, Shrestha et al. reported an HCV infection rate of 94% in 1998, whereas a recent study has shown a seropositivity rate of 85.5% in Kathmandu Valley (17,18).

MATERIALS AND METHODS

This was a retrospective study conducted at the Nepal Red Cross Society (NRSC), Central Blood Transfusion Service (CBTS). All blood donors who donated blood from 2001/2002 to 2006/2007 at BTS, hospital units or in mobile camps organized all over Nepal were reviewed. Blood donors were selected for donation according to the criteria of BTS based on the National Guidelines for BTS. Sera from blood donors were tested for anti-HCV antibodies by third generation enzyme-linked immunosorbent assay (ELISA) and for detection of HBsAg by HBsAg ELISA (HCV TRI-DOT Test, J. Mitra and Co., New Delhi, India; Hepacard, J.Mitra; Genedia HCV ELISA 3.0, Green Cross, Kyunggido, Korea; and Enzygnost HBsAg 5.0, Dade Behring, Marburg, Germany). Initial reactive samples were tested in duplicate. Repeatedly reactive results were considered seropositive for their respective infections (HBV or HCV). The data were entered in a Microsoft Excel spreadsheet, with the information collected from standard records in coordination with regional, district chapter, emergency BTS and hospital units. Statistical analysis was done using the software, Winpepi ver 3.8 (20). All the blood samples were anonymously tested, and confidentiality was maintained as per the guidelines of NRCS, BTS.
In this retrospective study, 524,328 blood donors nationwide and 200,673 donors at CBTS were reviewed over a period of 6 years. The overall seroprevalence rates of HBV and HCV among all blood donors nationwide were 0.82% (4,162/524,328) and 0.47% (2,489/524,328), respectively. The majority of the donors (89.2%) were males. A statistically significant decreasing trend was observed in HBV and HCV seroprevalence among blood donors nationwide in the years 2001/2002 - 2006/2007 ($P < 0.05$) (Table 1). The overall seroprevalence rates of HBV and HCV among the blood donors at CBTS, Kathmandu, were 0.92 and 0.71%, respectively (1,827/200,673 and 1,432/200,673, respectively). The majority of the donors were self-motivated volunteer donors. A statistically significant decreasing trend was observed in HBV and HCV seroprevalence among blood donors in CBTS in the years 2001/2002 - 2006/2007 ($P < 0.05$) (Table 2). The seroprevalence rate of HBV was significantly higher than seroprevalence rate of HCV both nationwide and at CBTS ($P < 0.05$). Though the overall trend was decreasing, the seroprevalence of HCV in the year 2006/2007 was higher than in the previous year both nationwide and at CBTS, Kathmandu (Figs. 1 and 2).

### RESULTS

In Nepal, hepatitis B is a major public health problem with a carrier rate of 200,000 and accounts for 6% of acute hepatitis. About 1% of the population are asymptomatic chronic HBsAg carriers, while 39% of patients suffering from chronic liver disease and 37% with hepatocellular carcinoma are HBsAg seropositive (4). This study uses data obtained using two different test kits for the detection of both HBV and HCV infection; however, the tests were of almost the same sensitivity, so the unification of these data to determine the seroprevalence might not have any significant effect. Similarly, in this study the nationwide analysis data also include the CBTS analysis data. This is done so that the nationwide scenario can represent the whole country while the CBTS scenario can represent the urban settings.

The present study revealed a statistically significant decreas-

### DISCUSSION

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### Table 1. Seroprevalence of HBV and HCV among blood donors nationwide from 2001/2002 - 2006/2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Total donors</th>
<th>Males</th>
<th>Females</th>
<th>HBV seropositive (%)</th>
<th>HCV seropositive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001/2002</td>
<td>72,459</td>
<td>92.03</td>
<td>7.97</td>
<td>627 (0.86)</td>
<td>384 (0.52)</td>
</tr>
<tr>
<td>2002/2003</td>
<td>73,758</td>
<td>90.91</td>
<td>9.09</td>
<td>911 (1.23)</td>
<td>417 (0.56)</td>
</tr>
<tr>
<td>2003/2004</td>
<td>76,647</td>
<td>89.78</td>
<td>10.22</td>
<td>663 (0.86)</td>
<td>321 (0.41)</td>
</tr>
<tr>
<td>2004/2005</td>
<td>82,677</td>
<td>85.59</td>
<td>14.3</td>
<td>644 (0.77)</td>
<td>373 (0.45)</td>
</tr>
<tr>
<td>2005/2006</td>
<td>103,067</td>
<td>88.6</td>
<td>11.4</td>
<td>887 (0.86)</td>
<td>366 (0.35)</td>
</tr>
<tr>
<td>2006/2007</td>
<td>115,720</td>
<td>88.4</td>
<td>11.6</td>
<td>430 (0.37)</td>
<td>628 (0.54)</td>
</tr>
<tr>
<td>Total</td>
<td>524,328</td>
<td>89.2</td>
<td>10.8</td>
<td>4,162 (0.82)</td>
<td>2,489 (0.47)</td>
</tr>
</tbody>
</table>

### Table 2. Seroprevalence of HBV and HCV among blood donors in CBTS from 2001/2002 - 2006/2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Total donors</th>
<th>Voluntary</th>
<th>Replacement</th>
<th>HBV seropositive (%)</th>
<th>HCV seropositive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001/2002</td>
<td>28,991</td>
<td>26,865</td>
<td>2,126</td>
<td>299 (1.03)</td>
<td>259 (0.89)</td>
</tr>
<tr>
<td>2002/2003</td>
<td>31,229</td>
<td>27,319</td>
<td>3,910</td>
<td>361 (1.15)</td>
<td>230 (0.74)</td>
</tr>
<tr>
<td>2003/2004</td>
<td>30,054</td>
<td>27,212</td>
<td>2,842</td>
<td>308 (1.02)</td>
<td>210 (0.69)</td>
</tr>
<tr>
<td>2004/2005</td>
<td>31,293</td>
<td>27,929</td>
<td>3,364</td>
<td>258 (0.82)</td>
<td>203 (0.64)</td>
</tr>
<tr>
<td>2005/2006</td>
<td>35,347</td>
<td>33,552</td>
<td>1,961</td>
<td>267 (0.75)</td>
<td>223 (0.63)</td>
</tr>
<tr>
<td>2006/2007</td>
<td>43,759</td>
<td>38,688</td>
<td>5,071</td>
<td>334 (0.76)</td>
<td>307 (0.70)</td>
</tr>
<tr>
<td>Total</td>
<td>200,673</td>
<td>181,565</td>
<td>19,274</td>
<td>1,827 (0.92)</td>
<td>1,432 (0.71)</td>
</tr>
</tbody>
</table>

CBTS, Central Blood Transfusion Service, Kathmandu.
ing trend for both HBV and HCV seroprevalence over the last 6 years. The decline in HBV and HCV seroprevalence rates might be due to the cumulative effect of increasing public awareness of infections with the respective viruses, leading to a decrease in new cases, implementation of stringent donor selection by BTS, and self-deferral by high-risk individuals. In Nepal, blood donors include the adult population in the 18-60 year age group, so the prevalence in other age groups is missed in such studies; however, it is generally accepted that the prevalence in blood donors, if interpreted cautiously, can provide insight into the epidemic condition in the general population. Significantly higher seroprevalence of HBV and HCV (0.92 and 0.71%, respectively) was observed in CBTS, Kathmandu, than in the nationwide analysis (0.82 and 0.47%, respectively) (P < 0.05). The data suggest that the seroprevalence rate is higher in the urbanized setting of Kathmandu Valley than in the nationwide analysis for HBV as well as HCV.

In contrast to our study, a statistically insignificant decreasing trend in HBV seroprevalence among blood donors was reported in New Delhi, India, from 2002 to 2005, and the overall seroprevalence was also markedly higher compared to the Nepalese scenario; however, a significantly decreasing trend was reported for HCV seroprevalence, and the overall seroprevalence was similar to that found in the present study (21). Similarly, a significant decreasing trend in seroprevalence for both HBV and HCV was reported by Emekdas et al. in Turkey from 1989 to 2004 (22). For HBV, the seroprevalence increased from 0.86 to 1.23% nationwide (P < 0.001) and from 1.03 to 1.15% in the CBTS analysis (P > 0.05) from 2001/2002 to 2002/2003. The seroprevalence at CBTS then decreased continuously until 2006/2007 while the nationwide seroprevalence decreased continuously until 2004/2005, increased slightly in 2005/2006 (P < 0.05), and decreased sharply in 2006/2007 (P < 0.001). The sharp drop of HBV seroprevalence in 2006/2007 is highly significant. This might be due to a considerable increase in public awareness regarding hepatitis B in recent years, the easy availability of hepatitis B vaccines at a relatively lower price, and the organization of mass vaccination programs by schools and communities. However, the cause of such a sharp decrease might be multifactorial, and further research is needed to determine the responsible factors. Identification of the responsible factors would also contribute to the development of programs to maintain the decreasing trends in seroprevalence. Similarly, for HCV, the nationwide seroprevalence rate decreased from 0.52 to 0.35% from the year 2001/2002 to 2005/2006 but increased significantly in the year 2006/2007, however, the seroprevalence rate continuously decreased from 0.89 to 0.63% at CBTS from 2001/2002 to 2005/2006, but showed an insignificant increase in 2006/2007. The significant increase of HCV seroprevalence in the year 2006/2007 might be the result of various factors such as the pressure of a continuously increasing demand for blood supply, the emergency need for large quantities of blood, the entry of large numbers of asymptomatic HCV chronic carriers into the age group eligible for blood donation, and an increase in test-seeking behavior. However, there is no published research verifying these speculations, so there is an urgent need for further good quality epidemiological studies in this area.

The trends analysis shows that though there was an overall decreasing trend for HBV as well as HCV both nationwide and in Kathmandu Valley, the test for the departure from a linear trend showed a statistically significant result (P < 0.05). The decreasing trend was sharper for HBV than for HCV, so further studies are needed to unravel the associated factors.

ACKNOWLEDGMENTS

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REFERENCES