

*Research article*

## **Transmission of hepatitis B virus infection among family contacts of chronic hepatitis B carriers in Sri Lanka**

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### **Abstract**

#### **Introduction**

Hepatitis B virus (HBV) infection is a major global health problem. Incidence of HBV infection in Sri Lanka is low compared to other countries in South Asia. Horizontal transmission among close contacts is a well recognized mode of HBV transmission. A high incidence of HBV infection has been reported among family contacts of chronic HBV carriers from different parts of the world. A study was therefore designed to describe HBV serology markers among family contacts of HBV chronic carriers who were diagnosed and followed up at the Department of Virology, MRI.

#### **Methods**

Serological markers of HBV infection was analyzed in 230 family contacts of 78 chronic HBV carriers diagnosed and followed up at the Department of Virology, Medical Research Institute, Sri Lanka from November 2008 to December 2012.

#### **Results**

Among screened family members, 55 (23.9%) were positive for HB core total antibody, indicating evidence of exposure to HBV at the time of screening. Among them 14 (6.1%) were positive for HBs antigen and serological evidence of past exposure to HBV was found in 41 (17.8 %). At least one member of the family was affected in 40 (51.3%) index cases. HBV infection rate among family members (23.9%) was significant compared to the general population (1.8%) in this study. Screening of family members and vaccination of non immune members should be encouraged to prevent spreading of the infection. Health education and counseling should be given to HBV infected patients and their contacts about the disease, mode of transmission and available preventive measures.

*Key words: Chronic hepatitis carriers, family contacts, Sri Lanka, serological markers*

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## Introduction

Hepatitis B virus (HBV) infection is a major global health problem. It can cause both acute hepatitis and chronic hepatitis.<sup>1</sup> Chronic hepatitis can progress to cirrhosis and hepatocellular carcinoma (HCC) leading to death. More than 350 million people are chronically infected with HBV in the world and more than 700 000 people die due to the consequences of HBV infections annually.<sup>2</sup>

Transmission of HBV infection mainly occurs through parenteral and sexual exposure. Vertical transmission occurs from infected mother to her baby during the perinatal period. In addition, horizontal transmission among close contacts is well recognized as a mode of transmission of HBV infection.<sup>1</sup>

The incidence of HBV infection in Sri Lanka is low compared to other countries in South Asia, The estimated prevalence being about 1.8%.<sup>3</sup> Although prevalence may vary from 0.3-2.3% in different study populations<sup>4</sup>, in South Asia, the prevalence is 2-4%, which is considered as intermediate endemicity.<sup>5</sup>

The chronic HBV infected carrier is defined as a patient who is positive for hepatitis B surface antigen (HBsAg) for more than 6 months.<sup>1</sup> HBV carriers can be symptomatic with ongoing chronic hepatitis or can be asymptomatic. Asymptomatic carriers can be a source of infection in the community as they are unaware of their infection.<sup>6</sup> A high incidence of HBV infection has been reported among family member of chronic HBV carriers from different parts of the world.<sup>7, 8,9,10</sup> Prevention of transmission to a spouse and to close contacts including other family members is therefore an important aspect in the management of HBV infections.<sup>11</sup>

HBV serological markers are useful to confirm diagnosis and evaluation of the natural history of HBV infection (Table 1). Further, HBV serology is used to identify treatment goals and to detect

**Table 1: Serology markers of HBV infection**

Marker	Acute HBV	Chronic HBV	Inactive carrier	Immunity following infection	Immunity following vaccination
HBc total Ab	+	+	+	+	-
HBc IgM	+	-	-	-	-
HBsAg	+	+	+	-	-
HBeAg	+	+/-	-	-	-
HBeAb	-	+/-	+/-	+/-	-
HBsAb	-	-	-	+	+

immunity following vaccination.<sup>1</sup> The Department of Virology, Medical Research Institute (MRI), Colombo is the main reference laboratory for hepatitis serology in Sri Lanka.<sup>12</sup> The majority of patients with suspected HBV infection are

referred to MRI by clinicians, private laboratories, National Blood Transfusion Service and peripheral laboratories throughout Sri Lanka for serological confirmation.

## Objectives

The main objective of the study was to describe the HBV serology markers among family contacts of HBV chronic carriers who were diagnosed and followed up by Department of Virology, Medical Research Institute, Colombo.

## Methods

From November 2008 to December 2012, all chronic HBV carriers who were diagnosed and followed up at the Department of Virology, MRI were included in the study. Among them, 78 cases were taken as index cases. Patients who were not available for contact screening or a family member linked to an index case were not considered as index cases. When more than one member of the same family was diagnosed as a chronic carrier, the first member who was diagnosed at MRI was taken as an index case. Following diagnosis, chronic HBV patients were advised and encouraged to inform close contacts regarding contact screening. Family members, who had regular contacts with the index case, were considered as close contacts.

**Table 2: HBV Serology markers among family contacts  
(Total number of screened= 230)**

Serology markers		Contacts		Interpretation
		No	%	
HBc total Ab	+	55	23.9	Past exposure to HBV infection
HBc total Ab HBs Ag	+ -	41	17.8	Evidence of past exposure to HBV infection
HBc total Ab HBs Ag HBs Ab	+ - +	36	15.6	Evidence of immunity following infection
HBc total Ab HBs Ag	+ +	14	6.1	Evidence of HBV infection
HBc total Ab HBs Ag HBe Ag HBe Ab	+ + + -	12	5.2	Active HBV infection
HBc total Ab HBs Ag HBe Ag HBe Ab	+ + - +	2	0.9	HBe seroconversion
HBc total Ab HBs Ab	- +	10	4.3	Evidence of immunity following vaccination

All index cases and their contacts were interviewed and counseled by the investigators following direct consultation. Consent was obtained from each individual prior to obtaining blood samples. Blood samples from the index cases and contacts were then tested for HBV serological markers. Each sample was tested for hepatitis B surface antigen (HBsAg), hepatitis B core IgM (HBc IgM), hepatitis B core total antibody (HBc total Ab), hepatitis B e antigen (HBeAg), hepatitis B e antibody (HBeAb) and hepatitis B surface antibody (HBsAb). Tests were performed using validated commercial ELISA kits according to manufacturer's instructions. Vaccination

history was taken from all family contacts prior to collection of the samples.

230 family members who were close contacts of index cases were screened. Family members, who were not in contact with index cases, were not included in to the study. Laboratory data on HBV serological markers was analyzed in all index cases and family members.

## Results

Among the 78 index cases, 52 (66.7%) were males and 26 (33.3%) females. The majority (56, 71.9%) were asymptomatic at the time of diagnosis as they were diagnosed as a result of screening for HBs Ag carried out in the following groups : inmates of a mental health care institution, at the National Blood Transfusion Services, medical testing for foreign employment, Cancer Institute, sexually transmitted disease clinics and prisoners.

The total number of screened family contacts was 230, which included 51 (22.2%) spouses and 179 (77.8%) other family members (siblings, children and parents).

Among the screened family contacts 55 (23.9%) were positive for HBc total Ab indicating evidence of exposure to HBV. Of them, 14 (6.1%) were positive for HBs Ag at the time of screening. Twelve (5.2%) HBsAg positive family members had active HBV infection with positive serology for HBeAg and negative for HBeAb. Among HBsAg positive patients, only 2 had evidence of HBe seroconversion (HBeAg negative / HBeAb positive). Among exposed contacts (HBc total Ab positive), 41 (17.8%) were negative for HBsAg indicating past infection of whom 36 (15.6%) were positive for HBs Ab indicating immunity following infection (Table 2).

Of 51 spouses who were screened, 19 (37.2%) had evidence of exposure. Among the other 179 screened family members, 36 (20.1%) had evidence of exposure to HBV. At least one member of the family was affected in 40 (51.28%) index cases.

Only 11 (4.8%) family contacts had taken HBV vaccine prior to screening and 10 of them were positive for HBs Ab. All were negative for HB core total antibody indicating immunity following vaccination. HBs Ab negative vaccinated contacts were negative for the other HBV serological markers.

## Discussion

The HBV infection rate among family members (23.9%) was significant compared to the general population (1.8%) in this study.<sup>3</sup> Sri Lanka is considered a low prevalence country for HBV infection. Inter-familial clustering of the infection was therefore clearly noted in this study population. A study conducted in 2007 demonstrated that 52.7% of family members were exposed to HBV infection in a group HBV positive cancer patients in Sri Lanka.<sup>13</sup> The results of the current study show that 51.3% of the index cases transmitted the infection to at least one family contact. This indicates the continuous occurrence of high HBV transmission among family contacts despite improvement of health care facilities in Sri Lanka. Lack of knowledge of disease transmission dynamics among health care providers could be one reason for these high rates of transmission. Among contacts, 12 (5.2%) were chronic active carriers at the time of screening. They can act as reservoir for the infection in society and can progress to cirrhosis and

HCC in later life.<sup>14,15</sup> The number of chronic active carriers (n=12) was significantly high among HBs Ag positive contacts (n=14) in the study population. Possible factors which contributed to this phenomenon need be evaluated.

The study results also show that spouses (37.2%) were exposed to the infection more often than other family members (20.1%). It is well known fact that HBV is transmitted more efficiently through sexual contact than horizontal transmission.<sup>1</sup>

The majority of the index cases were asymptomatic and were not aware of their HBV status. They were only detected during the present study. High rate of HBV transmission to family contacts from asymptomatic HBV carriers has been well demonstrated in previous studies.<sup>6</sup>

The 11 individuals who had received HBV vaccine prior to contact screening were children who were vaccinated through the Expanded Programme of Immunization (EPI). This shows that the inclusion of the hepatitis B vaccine in to the EPI is successful in preventing transmission of HBV infection in a low endemic population like Sri Lanka.

Screening of contacts and vaccination of non-immune members should be encouraged as soon as the diagnosis is confirmed. Vaccination with HBV vaccine is the most effective method of prevention.<sup>11</sup> Correct health education and counseling should be given to HBV infected patients and to their family members about the disease, mode of transmission and preventive measures. Health care providers also need to be more vigilant on the issue of intra-familial transmission of HBV.

HBV vaccination to high risk groups also needs to be enforced to prevent spread of the infection. High rates of HBV transmission were reported in certain health care settings such as cancer units, mental health hospitals, dialysis units and thalassemia units. HBV vaccination is recommended to all patients in such units.

HBV vaccine was included in the EPI programme in Sri Lanka since 2008 and the immune population will increase with time. However, adolescents and adults do not receive HBV vaccine routinely. We should therefore be vigilant, particularly in high risk groups, to recommend and carry out vaccination proactively to prevent spread of the disease in the country. It is important to formulate national guidelines on management and prevention of HBV infection to strengthen HBV preventive strategies.

There are a few limitations in this study. We considered index cases depending on the order of their presentation for diagnostic testing at the MRI, but there may be situations where the index case may not be the first case within the family. Due to limited resources, molecular (viral load and genotyping) biochemical markers and liver histology were not evaluated in all the index cases and positive family contacts.

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## Conflict of interest

No conflict of interest is declared.

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