Intra-Familial Transmission of Hepatitis B Virus in Aden - Yemen


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Abstract

Hepatitis B virus (HBV) is a major challenge to public health worldwide. Close contacts between susceptible family members and the index cases who live with HBV infection increase the rate intra-familial transmission of HBV. So our study aimed to determine the prevalence of HBV infection among family members of confirmed positive HBV patients and to identify the intra and extra-familial risk factors contributing for transmission of HBV infection among those members. Analytical cross-sectional study was conducted on 100 family members who belong to the 14 index cases were included in this study, the average was 7.1(100/14) members. HBsAg in both index cases and family members was determined by using ELISA kit. Analysis of the data was performed by using SPSS (Version 21), the quantitative data were expressed as mean values, (SD) because the data was normal distributed. The qualitative data was expressed as percentages and χ² test was used for comparison of two variables to determine the p-value where ≤0.05 was considered statistically significant. They were 50 (50%) males with a total mean± SD of age were 25±15.9 years. The overall prevalence of HBV infection was 19 (19.0%). The highest rates were 41.2% in age group 30—39 years, 22% males, 26.7% married, 19.4% among those family members who were in close contact with female index cases and 40% father relatives. A statistically significance association between HBV infection and age group 30—39 years (p=0.011). There were no positive cases was found among those members who were vaccinated against HBV and no significant association between HBV infection and either intra or extra risk factors among family members. It can be concluded that Intra-familial transmission of HBV infection was high among family member in Yemen. The highest prevalence was found in age group 30-39 years, males, married and among those family members who were in close contact with female index cases. The most frequent relatives with HBV infection were fathers, while a negative HBV cases was observed among mothers and wives and vaccinated members. There were no significant association between HBV infection and either intra or extra risk factors among family members.

Keywords: Intra-familial, Hepatitis B virus, Transmission, Aden.

1. Introduction

Hepatitis B virus (HBV) is contagious life threatening infectious agent of liver that cause Hepatitis B infection [1]. HBV is member DNA viruses that belonging to Hepadnaviridae. It is enveloped and the severity is ranged from mild asymptomatic to severe chronic infection where it may lead to cirrhosis and cancer of liver cells [2]. It is a major challenge to public health worldwide [3]. In 2024, every year, the number of people who die from chronic hepatitis B infection rises and it estimated that more than 250 million of population around the world had chronic HBV infections [4]. Contact with blood or other body fluids of an infected person may consider the main transmission route of virus [5]. Other transmission routes are parenteral, sexual transmission and vertically from mothers to their child [6]. Close contacts between susceptible family members and the index cases who live with HBV infection increase the rate intra-familial (horizontal) transmission of HBV [7]. The presence of infected family members is
significantly increasing the risk of transmission of virus to other members [8]. Despite the mechanism and sequences of spreading of infection among family members is not well known and un ability due to determine if there were the index case or another family member was firstly infected with HBV [9]. The viral DNA HBV is found in almost all body fluids of infected index case. Therefore, transmission to family members occurs through close contact with these fluids [10] and by sharing of infected personal care objects especially razor, face towels, toothbrush and nail clipper [11,12,13,14]. Lack of financial resources or the lack of awareness about the transmission HBV infection through these objects may increase the infection rates among those members [15]. Globally, the prevalence of HBV infection among members of family who in closed contact with index cases ranges from 1.3-61.5% [16,17]. In Yemen, little information is available about interfamilial infection of HBV. Two studies conducted among family members in Yemen in which the prevalent rates were (10.2% and 10.7%) [18,19]. So our study was aimed firstly to determine the prevalence of HBV infection among family members of confirmed positive HBV patients (index cases) who were attending to different hospitals and clinics in Aden and secondly to identify the intra and extra-familial risk factors contributing for transmission of HBV infection among those family members.

2. Subjects and Methods

This an analytical cross-sectional study was conducted on 14 hepatitis B positive patients (index cases) and 100 of their family members who were accepted for participation in the study at AL-Gamhoriah Modern General Hospital and Al-Sadaqa Teaching Hospital) in Aden, Yemen. The data was collected by questionnaires, which contain questions as socio-demographic data, relation to index cases and other questions about risk factors for HBV infection. Five ml of blood were collected in plane tube and after clotting of the blood, the serum was separated and hepatitis B surface antigen (HBsAg) in both index cases and family members was determined by using enzyme-linked immunosorbent assay (ELISA) kit. Analysis of the data was performed by using SPSS (Version 21), the quantitative data were expressed as mean values, standard deviation (SD) because the data was normal distributed and the qualitative data was expressed as percentages and chi-square (χ²) test was used for comparison of two variables to determine the p-value where ≤0.05 was considered statistically significant.

3. Results

One hundred family members who belong to the 14 index cases were included in this study, the average was 7.1 (100/14) members. The mean age of the family members was 25±15.9 years. The minimum and maximum of the ages were 1 and 70 years. There were 50 (50 %) males with the mean age of 23±15.0 years, (Table 1).

In our study, the prevalence of HBV infection was 19 (19. 0%). The highest rates were 41.2% in age group 30—39 years, 22% males, 26.7% married and 19.4% among those family members who were in close contact with female index cases and 40% father relatives. A statistically significance association between HBV infection and age group 30—39 years (p=0.011) (table 2). There was no positive cases found among those members who were vaccinated against HBV and no significant association between HBV infection and either intra or extra risk factors among family members were found (tables 3).

Table (1): Distribution of family members of HBV cases by age and sex

<table>
<thead>
<tr>
<th>Age groups/years</th>
<th>Male (n=50)</th>
<th>Female (n=50)</th>
<th>Total (n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>10 (20.0)</td>
<td>10 (20.0)</td>
<td>20 (20.0)</td>
</tr>
<tr>
<td>10 – 19</td>
<td>11 (22.0)</td>
<td>6 (12.0)</td>
<td>17 (17.0)</td>
</tr>
<tr>
<td>20 – 29</td>
<td>15 (30.0)</td>
<td>15 (30.0)</td>
<td>30 (30.0)</td>
</tr>
<tr>
<td>30 – 39</td>
<td>7 (14.0)</td>
<td>10 (20.0)</td>
<td>17 (17.0)</td>
</tr>
<tr>
<td>≥ 40</td>
<td>7 (14.0)</td>
<td>9 (18)</td>
<td>16 (16.0)</td>
</tr>
<tr>
<td>Mean/years</td>
<td>23</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>SD/years</td>
<td>15</td>
<td>16.7</td>
<td>15.9</td>
</tr>
<tr>
<td>Min/years</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max/years</td>
<td>70</td>
<td>66</td>
<td>70</td>
</tr>
</tbody>
</table>

4. Discussion

The prevalence of HBV infection among family members in this study was almost same to that conducted by Chakravarty et al. from India 19.4% [20] and by Hatami et al. from Iran (19.3%) [7]. In contrast, our rate was lower than that reported among family members in different countries as (20-25%) in Iran [21,22], 24.3% in Brazil [23], 29.3% in Egypt [24], 30.6% in India [25], 38% in Turkey [26], and 49.4% and 61.5 % in two Iranian studies [17,21]. Other studies recorded lower prevalence such as 16% in Greece [27], 15.15% in Indonesia [28] and 12.1% in Bosnia and Herzegovina [27], 11% in Iran [29], 10.7% and 10.2% in two Yemeni studies [18,19], 10.1% in Brazil [23] and 5.4% in Tanzania [30]. El-Sayed et al. from Egypt revealed one of lowest rate 1.3% [16].

Table (2): The prevalence of HBV infection among family members according to age

<table>
<thead>
<tr>
<th>Variables</th>
<th>HBV + ve</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age groups/Years</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>&lt; 10 (n=20)</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>10–19 (n=17)</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>20–29 (n=30)</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>30–39 (n=17)</td>
<td>7</td>
<td>41.2</td>
</tr>
<tr>
<td>≥ 40 (n=16)</td>
<td>3</td>
<td>18.8</td>
</tr>
<tr>
<td>Total (n= 100)</td>
<td>19</td>
<td>19.0</td>
</tr>
</tbody>
</table>

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The prevalence of HBV in our sample was lower than that reported among Yemeni population in Zabeed city (48.83%) and Hodeidah city (42.67%) \cite{31,32}. The main factors contributing to differences in HBV seroprevalence among family members in different countries may be attributed to habitual and sociocultural states of those population\cite{7}.

The current study was agreed with that stated in Yemen, Iran and Pakistan in which the highest prevalent rate of HBV infection was observed in the age group 30-39 years \cite{9,18,33}. Mangowi et al. revealed a high rate in the age >45 years \cite{30}. Another study in Yemen noted that age group 20-29 had highest prevalence \cite{19}.

**Table (3): The intra and extra-familial risk factors contracting for HBV infections and vaccination status among family members**

<table>
<thead>
<tr>
<th>Intra-familial Risk factors</th>
<th>HBV +ve</th>
<th>p</th>
<th>Extra-familial Risk factors</th>
<th>HBV +ve</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharing shaving tools (n=7)</td>
<td>1</td>
<td>14.3</td>
<td>0.742</td>
<td>Surgical operation (n=26)</td>
<td>7</td>
</tr>
<tr>
<td>Sharing toothbrush (n=9)</td>
<td>1</td>
<td>11.1</td>
<td>0.527</td>
<td>Blood transfusion (n=15)</td>
<td>4</td>
</tr>
<tr>
<td>Sharing spoon and eating utensil (n = 52)</td>
<td>13</td>
<td>25.0</td>
<td>0.111</td>
<td>Cupping (n=15)</td>
<td>2</td>
</tr>
<tr>
<td>Expose to needles stick (n=7)</td>
<td>2</td>
<td>28.6</td>
<td>0.503</td>
<td>Exposed to needle stick (n=3)</td>
<td>1</td>
</tr>
<tr>
<td>Expose to biting (n=9)</td>
<td>1</td>
<td>11.1</td>
<td>0.527</td>
<td>Dental procedures (n=22)</td>
<td>5</td>
</tr>
<tr>
<td>Sharing of nail clippers (n=54)</td>
<td>11</td>
<td>20.4</td>
<td>0.705</td>
<td>Tattooing (n=6)</td>
<td>1</td>
</tr>
<tr>
<td>Sharing of towels (n=18)</td>
<td>1</td>
<td>5.6</td>
<td>0.108</td>
<td>Sharing of ear pricing tools (n=11)</td>
<td>0</td>
</tr>
<tr>
<td>Sharing the same sleeping places (n= 14)</td>
<td>3</td>
<td>21.4</td>
<td>0.803</td>
<td>Vaccination (n= 6)</td>
<td>0</td>
</tr>
</tbody>
</table>

**Fig. (1):** The prevalence of HBV infection among family members according to their sex

**Fig. (2):** The prevalence of HBV infection among family members according to their marital status
partners, acquire tattoos, and engage in other risky behaviors that may contribute to the higher prevalence of HBV in this population [30]. Other studies reported highest rate among females [9,27].

Similar results were reported in Bosnia and Herzegovina, Egypt and Yemen that in which highest prevalence was found among family members who were in close contact with female index case[ 16,27], but disagreed with that conducted in Iran [17,19]. These differences might be attributed to number of female index cases in these studies [19].

A study was conducted in Egypt was agreed with current findings in which the highest prevalence was also found among fathers [16], but it was disagreed with various studies done in brazil, Yemen and Bosnia and Herzegovina, where there was zero case among fathers [19,23,27]. Other researcher reported that highest rates were among mothers [22], parents [28], spouse [9], wives [29], brothers [7,19], and offspring [39]. There was no any HBV case among mothers and wives in our study. This was disagreed with that found in two Iranian studies [22,29]. This may be attributed to that the fathers are more likely to have close contact with infected sons, daughters and other family members [30].

Regarding to vaccination status, there was no positive cases found among those members who were previous vaccinated against HBV. Siddique et al., recorded that 28.8% of vaccinated members had HBV infection [38]. Two studies undertaken in Egypt and Yemen showed that 32.9%, and 14% of those individuals who received vaccine had infection, respectively [19,24].

The limitations of our study were sample size and the inability of the ELISA test to identify occult Hepatitis B virus infection (OBI), and inability to detect viral DNA genome by using molecular techniques.

5. Conclusions

Intra-familial transmission of HBV infection was high among family member in Yemen. The highest prevalence was found in age group 30-39 years, males, married and among those family members who were in close contact with female index cases. The most frequent relatives with HBV infection were fathers, while a negative HBV cases was observed among mothers and wives and vaccinated members. There were no significant association between HBV infection and either intra or extra risk factors and vaccination status and family members.

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انتشار فيروس التهاب الكبد B بين العائلات في اليمن
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لا يوجد أيضًا علاقة ذات دلالة بين انتشار الفيروس وعوامل الاختطار الداخلي والخارجي. ينتج عن هذه الدراسة أن معدل انتشار فيروس التهاب الكبد B بين أفراد العائلة كان أعلى بنسبة 26.7%، وكان معدل الانتشار علاى على أفراد العائلة بنسبة 30-30 سنة. لم تظهر هذه الدراسة أي اصابة بـ أي من العوامل المتبررة، ولهما فرضية علاقة ذات دلالة بين النسبة المتبررة بين العائلات في عدن.

النتيجة النهائية: بـ B، انتقال عدن.

الكلمات المفتاحية: انتقال فيروس التهاب الكبد B، بيانات.

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