Susceptibility of children in Duhok to hepatitis B viral infection

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ABSTRACT

Objectives
To evaluate the immunization rate against hepatitis B-virus in a group of children below ten years of age in Duhok, Iraq.

Patients and Methods
This study was included 91 children attending the outpatient department at Heivi-Paediatric Hospital in Duhok from June 2010 to December 2010. Their ages ranged from 12 months to 10 years. They were 44 male and 47 female. To determine response to vaccination against HBV, serological assessment was done using Enzyme Linked Immunosorbent Assay (ELISA) to detect the anti hepatitis-B surface antibodies (anti HBs), anti hepatitis-B core (anti HBe) antibodies and hepatitis-B surface antigen (HBsAg).

Results
Forty eight (52.7%) out of 91 children indicated coverage rate of vaccination, twenty two of them were male and the remaining twenty six were female. Eight children (8.7%) were positive for AntiHBe antibodies, 3 males and 5 females which revealed that they had been infected with the virus and it was found that seven of these eight
children also had anti HBs antibodies. The eighth female children were found to harbor HBsAg.

**Conclusion**

The coverage rate of vaccination program in this study is lower than that mentioned in other countries. It was difficult to ensure that enrolled children had received the 3 doses of vaccine. (Rawal Med J 2011;36:255-258).

**Key words**

HepatitisB vaccine, Anti hepatitis-B surface antibodies, HBsAg.

**INTRODUCTION**

Hepatitis B virus (HBV) infection is one of the most important global health problems, infecting 2 billion people worldwide, of whom 350 million are suffering from chronic HBV infection, an estimated 75% of whom live in developing countries.\(^1\,^2\) HBV infections result in 500,000 to 1.2 million deaths per year induced by chronic hepatitis, cirrhosis, and hepatocellular carcinoma and is 10th leading cause of death worldwide.\(^3\) Between 35-40% of all the HBV infections every year are result from vertical transmission.\(^4\) The incidence of perinatal infection is around 70-90%, when the mother is both HBsAg positive and HBeAg-positive.\(^5\,^6\) For neonates and children younger than 1 year who acquire HBV infection perinatally, the risk of the infection becoming chronic is 90%.\(^7\) Highly effective hepatitis B vaccines now provide long-term immunity against HBV infection\(^8\,^9\) and their widespread use in many areas of the world has dramatically reduced the carrier rate of HBV and significantly decreased the incidence of childhood hepatocellular carcinoma.\(^10\,\!^11\) Hepatitis B vaccine has been integrated into their national immunization programs in nearly 152 countries.\(^12\,\!^13\) The potential impact of vaccination programs and vaccination efficacy has been evaluated in many
countries. After the vaccination, a decrease in the carriage rate from 8.8% before to 0.9% after occurred in a hyperendemic region in south western Saudi Arabia in children aged less than 1 year.\textsuperscript{14} Another report from Taiwan showed that among 1200 children who had received HBV vaccination in infancy, protective antibodies could be found in 71.1% at age 7 and 37.4% at age twelve.\textsuperscript{15} The aim of this study was to evaluate the immunization rate against HBV in children below ten years of age in Duhok, Iraq.

**PATIENTS AND METHODS**

This study was started at June 2010 and completed at December 2010. The study included 91 children who were attending the outpatient department at Heivi-Pediatric Hospital in Duhok. They had different complaints but no one was suffering from hepatitis signs and symptoms. All children with chronic disease such as diabetes mellitus, congenital heart disease, chronic renal failure, thalassemia major or any hematologic disease leading to blood transfusion were excluded from the study. The study protocol included examination of children for the presence of Hepatitis B-virus serological markers to detect the rate of vaccination against HBV and the response to vaccination.

The children relatives were asked to answer a questionnaire which included the following: age, gender, residence, history of chronic medical illnesses, history of jaundice in child or any other member in the family and history of vaccination schedule. HBV vaccine is given in our country in 3 doses started from the first visit at the first week after birth, second dose at one month and third dose at six month. An age of 12 months was selected to check anti HBs. Since the program of HBV vaccination had started at 1999 in Duhok, maximum age chosen was 10 years.
Serological assessment was done using Enzyme Linked Immunosorbent Assay (ELISA) which included HBsAg, antibody to HBs (anti HBs) and anti HBc. Statistical analysis was done using Chi square test and a p<0.05 was considered statistically significant.

**RESULTS**

The ages of participants extended from 12 months to 10 years. They were 44 male and 47 female. Fifty five out of 91 children (60.5 %) were antiHBs antibodies positive (Table 1).

**Table 1. Distribution of AntiHBs antibodies.**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Anti HBs+ve Number (%)</th>
<th>Anti HBs-ve Number (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>25 (56%)*</td>
<td>19 (43.18)</td>
<td>44</td>
</tr>
<tr>
<td>Female</td>
<td>30(63.82%)**</td>
<td>17 (36.17%)</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>55 (60.5 %)</td>
<td>36 (39.5 %)</td>
<td>91</td>
</tr>
</tbody>
</table>

*3 children had Anti HBc **5 children had AntiHBc one of them with positive HBsAg
P=0.494 non significant (χ² =0.4673)

Eight children were positive for antiHBc antibodies (8.7%), 3 were males and 5 females. Eight females were found to harbor HBsAg rather than antiHBs antibodies.

**Table 2. Distribution of AntiHBs antibodies and AntiHBc according to age.**

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>Anti HBs+ve Number (%)</th>
<th>Anti HBs-ve Number (%)</th>
<th>Anti HBc+ve Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>15/19 (78.94%)</td>
<td>4/19 (21.05%)</td>
<td>1/19 (5.26%)</td>
</tr>
<tr>
<td>3</td>
<td>6/7 (85.71%)</td>
<td>1/7 (14.28%)</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>3/5(60%)</td>
<td>2/5 (40%)</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>5/10 (50%)</td>
<td>5/10(50%)</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>4/6 (66.66%)</td>
<td>2/6(33.33%)</td>
<td>1/6 (16.66%)</td>
</tr>
<tr>
<td>7</td>
<td>5/8(62.5%)</td>
<td>3/8 (37%)</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>4/8(50%)</td>
<td>4/8(50%)</td>
<td>1/8 (12.5%)</td>
</tr>
<tr>
<td>9</td>
<td>2/5 (40%)</td>
<td>3/5(60%)</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>12/23 (52.17%)</td>
<td>11/23 (47.82%)</td>
<td>5/23 (21.73%)</td>
</tr>
</tbody>
</table>

P=0.071, non significant difference between the age group 1-2 and the age group 10 year. (χ²=3.248)
One out of 91 children was found to have HBsAg (1.1%) and he also had antiHBc antibodies. Highest percentage of antiHBs antibody positivity was found in age group 1-3 years (80.76%) while the lowest percentage was in the age group 9-10 years old (Table 2).

DISCUSSION

This study revealed that eight of the 55 children with positive AntiHBs antibodies had AntiHBc which indicated that their protective antibodies were due to previous infection and recovery rather than vaccination. The questionnaire filled by relatives to document the vaccination schedule of their children was unreliable which made the interpretation of negative AntiHBs results a difficult as to whether it was due to non vaccination or failure of the child to respond to three doses of vaccination.

This study also revealed that among the 91 studied children one of them (1.1%) had chronic infection and another 8 (8.7%) had evidence of natural infection with recovery (with positive antiHBc and antiHBs titers). The highest percentage of positive AntiHBs antibodies was found in age group 1-3 years (80.76%) while the lowest percentage was in the age group 9-10 years old (50%), which showed effectiveness of vaccination program.

A similar study from Turkey on 210 vaccinated children 12 to 48 months old showed that 96.7% had protective anti-HBs levels (> or = 10 IU/l), 0.5% had evidence of natural infection (with positive anti-HBc and anti-HBs titers), 0.5% had acute or chronic infection (with positive HbsAg and anti-HBc titers) and 2.3% were seronegative. 16 Another study from Turkey found the percentage of anti-HBs, anti-HBc, and HBsAg 90.2%, 7%, and 2.7% respectively. 17 Hashemi et al found that out of the 394 vaccinated children aged 6 to 8 years in southern Iran, nearly 63.1% had post-vaccine protective immunity against HBV with an acceptable anti HBs titer of
>10 IU/ml, even more than seven years after vaccination. Several studies from different countries have reported a range of 48 to 79% for a significant anti HBs antibody level after 5-7 years follow up.\textsuperscript{19,20} According to these findings, the need for a booster even after 5 years after vaccination has been under question. Globally, the prevalence of the HBsAg carrier state has changed rapidly since the availability of HBV vaccine and implementation of mass immunization in infants. Cyprus, Iraq, Georgia, and the United Arab Emirates are in the intermediate endemicity area with 2-5% rates.\textsuperscript{21-23} A study from Taiwan showed that prevalence of HBsAg in children under 5 years of age decreased from 9.3% in 1984 to about 2% in 1989 after implementation of a nationwide HBV immunization program of newborns.\textsuperscript{24} The coverage rate of vaccination program in this study was lower than that mentioned in other countries which could be attributed to many factors including sample size, the collection of samples from one site although the studied children were from different geographical places and one should consider the relative short time following the beginning of vaccination program in this region since 1999-2000. In the mentioned studies the rate of vaccination is measured among children who had received the 3 doses of vaccine while in this study it was difficult to ensure that enrolled children had received the 3 doses of vaccine.

**CONCLUSION**

The coverage rate of vaccination program in this study was lower than in other countries. In our study it was difficult to ensure that all enrolled children had received the 3 doses of vaccine.
REFERENCES


The Efficacy of Hepatitis B Vaccination among School Age Children in Southern Iran. IRCMJ 2010;12:45-8.


