

Original Article

Evaluation of Hepatitis B Infection Prevalence in Institutionalized Intellectually Disabled Children

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Abstract

Background: Hepatitis B virus (HBV) infection causes chronic infection in human population, with high mortality. One of the high risk communities is mentally retarded children, who are institutionalized. Special conditions in these centers predispose children for HBV infection and transmission to healthy people. In this study our objective was to determine the prevalence of HBV infection among institutionalized mentally retarded children and study its associated risk factors.

Materials and Methods: In this study, 250 mentally retarded children (younger than 14 years old) were included. They were living in 5 nursing institutions, located in different parts of Tehran. Hepatitis B surface antigen (HBsAg) was measured in the sera of these patients by ELISA method.

Results: Among 250 children, 20 children (8%) were HBsAg positive. HBV infection in girls was more than boys (11% to 5.6%). Among the types of mental retardation, children with cerebral palsy had the highest positive result for HBsAg. The most HBV infection (28.5%) was seen in children with longest duration of being institutionalized (10 to 11 years). Vaccinated children were more HBsAg positive (8.7%) than non-vaccinated children (5.3%). However, no significant relationship was observed between any of these factors and HBsAg positivity.

Conclusion: Despite improvement of people's health condition and implementation of HBV vaccination, the prevalence of HBV infection is increased in institutionalized mentally retarded children, which highlights the need for active measures to reduce this infection among this high risk population.

Keywords: Hepatitis B virus, Mentally retarded, HBV vaccine, intellectually disabled children

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Introduction

More than two billion of the world's population are exposed to hepatitis B virus (HBV)^{1,2} and 350 million of them, (5% of the world population) are infected with HBV chronically³. HBV cause the most

common chronic infection in human population and approximately 1 million people suffer from its dangerous complications such as cirrhosis and liver cancer⁴.

Age of infection with HBV is inversely correlated to its chronicity. Risk of chronic disease is about 90% in

the prenatal cases, 50% in patients 1-5 years old and less than 5% in adults⁵.

Iran is in the moderate prevalence zone of infection with HBV. Since 1993, neonates are vaccinated against this virus, which has led to reduction of the incidence of new cases of the disease, from 3.5% to 1.7%⁶.

However, many factors, in different populations, are involved in the prevalence of hepatitis B that interferes with the control of the virus spread. One of these factors is living in special communities, with different lifestyle and different physical and behavior characteristics, which is the reason of increased incidence of the infection comparing normal population. One of this special communities is institutionalized mentally retard children. Several reports have shown that people who live in crowded centers such as institutionalized mentally retarded children or old people living in nursing homes are at a high risk of infections with hepatitis particularly hepatitis B⁷⁻⁹.

High prevalence of hepatitis B infection in these people has several reasons, such as frequent contact with blood and body fluids of infected subjects as a result of overpopulation of institutions, having shared nurse and so increased communication between patients and healthy subjects, inappropriate patients' hygiene, and aggressive behaviors among these children, such as biting^{10,11}.

In addition, children with intellectual disability, such as Down syndrome, may also suffer from partial immunodeficiency⁷ and abnormal activity of the thyroid gland¹², which increases the risk of developing infections. The duration of being institutionalized has also direct relationship with the prevalence of infection in these patients⁸. The frequent use of antiepileptic drugs can suppress immune system and cause weak response to vaccines, which in turn leads to increased prevalence of chronic hepatitis B, cirrhosis and liver cancer in mentally retarded children.

Only study in this field in Iran is the study done in 2003 about prevalence of HBV infection among institutionalized mentally retarded children¹². However, the presence of factors such as weak immune system, possibility of formation of vaccine escape strains, high-risk behaviors and risk factors among these patients highlights the need for a new

and detailed study. So, we aimed to determine the status of HBV infection among mentally retarded children after 10 years and examined the risk factors of HBV infection in these children.

Methods

In this study, 250 mentally retarded children (younger than 14 years old) were included. They were living in 5 nursing institutions, located in different parts of Tehran. Also, the consent form was filled in by their parents or the supervisor of those centers for sample collection.

The patients' information, such as age, sex, type of disability, duration of being institutionalized, and HBV vaccination history were recorded in a questionnaire. Five milli liter bloods was collected from each patient and after separation, the sera were stored in -20°C, until the time of the tests. Presence of Hepatitis B surface antigen (HbsAg) in patients' serum was evaluated with ELISA assay (specificity>99%), using DIA PRO kit (Milano, Italy). The test was done according to the manufacturer's instruction. The data was analyzed, using SPSS 16.0 software.

Results

Among 250 children, 141(56.4%) were boys and 109 (43.6%) were girls. The mean and standard deviation of age were 9.4±4.2 years. In terms of disability, 13 (5.2%) had Autism, 42 (16.8%) had cerebral palsy (CP), 47 (18.7%) had Down's syndrome (DS), and 148 (59.2%) had other types of mental retardation (MR). Duration of being institutionalized ranged from 1 to 11 years. More than 75% of the children had a history of being institutionalized less than 5 years and the rest of them have been institutionalized for 6 to 11 years. According to their records, 194 children (77.6%) were vaccinated against HBV and 56 children (22.4%) were not vaccinated or their vaccination history was not available. The patients' characteristics are summarized in table 1. 20 children (8%) were positive for HBsAg.

Among the infected children, 8 (40%) were boys and 12 (60%) were girls. HBsAg positivity rate was 6.5% among boys and 11% among girls, but there was no significant association between the gender of the patients and being HBs Ag positive ($P>0.05$).

Table 1: The characteristic of the study subjects.

| Characteristics | HBsAg positive (n) | HBsAg negative (n) | HBsAg positive (%) | Total | P-value |
|----------------------------|--------------------|--------------------|--------------------|-------|---------|
| Sex | | | | | |
| Boys | 8 | 133 | 5.6 | 141 | >0.05 |
| Girls | 12 | 97 | 11 | 109 | |
| Type of retardation | | | | | |
| CP | 5 | 37 | 11.9 | 42 | >0.05 |
| Down | 3 | 44 | 6.3 | 47 | |
| MR | 11 | 137 | 7.4 | 148 | |
| Autism | 1 | 12 | 7.6 | 13 | |
| Institutions | | | | | |
| No.1 | 2 | 19 | 9.5 | 21 | >0.05 |
| No.2 | 6 | 45 | 11.7 | 51 | |
| No.3 | 4 | 95 | 4 | 99 | |
| No.4 | 8 | 56 | 12.7 | 64 | |
| No.5 | 0 | 15 | 0 | 15 | |
| Vaccination history | | | | | |
| Vaccinated | 17 | 177 | 8.7 | 194 | >0.05 |
| Non vaccinated | 3 | 53 | 5.3 | 56 | |

The most positive results for HBsAg were seen in children 3 to 4 years. Among 14 children 3 to 4 years old, 4 (28%) were HBsAg positive (Table 1), but here was no significant association between the presence of HBsAg and age (P>0.05).

CP children had the most HBsAg positivity, but there was no relationship between HBsAg positivity and type of mental disability (P>0.05). Among 42 children with CP, 5 (11.9%) were HBsAg positive. In children with Autism 7.6%, MR 7.4%, and DS 6.3% were HBsAg positive.

Among institutions included in this study, center

number 4 had the most children with positive HBsAg (12.7%). HBsAg was positive in 9.5% of children in center 1, 11.7% in center 2, and 4% in center 3. There was no HBsAg positive child in center 5. There was no significant relationship between the institution the children were living and of HBsAg positivity (P>0.05).

As shown in table 2, most children with positive HBsAg (28.5%) were those with longest stay in institutions (10 to 11 years), but here was no significant association between HBsAg and length of their stay (P>0.05).

Table 2: The results of HBsAg test in different age groups in institutionalized mentally retarded children.

| Age (years) | HBs Ag negative (n) | HBs Ag positive (n) | HBs Ag positive (%) | Total |
|-------------|---------------------|---------------------|---------------------|-------|
| 0-1 | 10 | 0 | 0 | 10 |
| 1-2 | 6 | 1 | 14 | 7 |
| 2-3 | 10 | 1 | 9 | 11 |
| 3-4 | 10 | 4 | 28 | 14 |
| 4-5 | 19 | 1 | 5 | 20 |
| 5-6 | 13 | 1 | 7 | 14 |
| 6-7 | 12 | 0 | 0 | 12 |
| 7-8 | 10 | 0 | 0 | 10 |
| 8-9 | 12 | 1 | 8 | 13 |
| 9-10 | 11 | 0 | 0 | 11 |
| 10-11 | 19 | 1 | 5 | 20 |
| 11-12 | 22 | 2 | 8 | 24 |
| 12-13 | 17 | 2 | 11 | 19 |
| 13-14 | 59 | 6 | 9 | 65 |

Among 194 children, who were vaccinated against HBV, 17 children (8.7%) were HBsAg positive, while among 53 non-vaccinated children, only 3 (5.3%) were HBsAg positive. There was no significant relationship between vaccination history of these patients and positive HBsAg ($P>0.05$).

Discussion

Numerous studies worldwide have reported high prevalence of HBV infection in mentally retarded children and have shown that many factors contribute to this high incidence^{11,13}.

Among these studies, a study in 1975 in Canada, on institutionalized mentally retarded children reported the high prevalence of HBV infection among patients

Table 3: HBsAg status according to duration of being institutionalized.

| Duration of being institutionalized (years) | HBsAg negative (n) | HBsAg positive (n) | HBsAg positive (%) | Total |
|---|--------------------|--------------------|--------------------|-------|
| 0-1 | 47 | 5 | 9.6 | 52 |
| 1-2 | 43 | 6 | 12.2 | 49 |
| 2-3 | 35 | 2 | 5.4 | 27 |
| 3-4 | 31 | 1 | 3.1 | 32 |
| 4-5 | 29 | 0 | 0 | 29 |
| 5-6 | 10 | 0 | 0 | 10 |
| 6-7 | 7 | 1 | 12.5 | 8 |
| 7-8 | 11 | 0 | 0 | 11 |
| 8-9 | 2 | 0 | 0 | 2 |
| 9-10 | 5 | 1 | 16.6 | 6 |
| 10-11 | 10 | 4 | 28.5 | 14 |

with Down syndrome comparing other types of mental retardations and normal population⁹. The evaluated risk factors in this study were age, sex, and length of stay. Although this study didn't report significant difference between girls and boys in HBV infection, it suggested that being institutionalized from young age is the most important factor in increasing the risk of HBV infection. In our study, although HBsAg was positive in girls twice than boys, there was no significant association between sex and positive HBsAg. The most positive HBsAg result (28%) was reported among children 3-4 years old.

A study in 1992 in Spain¹⁴, carried out to evaluate differences in the prevalence of positive HBsAg in two groups of patients with Down syndrome and other

mental retardations, it was reported that 26% of patients with Down syndrome and 8% of patients with other mental retardations were infected with HBV. In another study in 1975 in Canada⁹, the prevalence of positive HBsAg in patients with Down syndrome was reported 34.8% and in other mental retardations 5.3%. Dutch researchers¹⁵ also reported direct association between prevalence of HBV infection and type of disability, with high prevalence HBV infection in Down syndrome comparing other mental retardations. In the present study, although we observed no significant association between type of disability and positive HBsAg, high HBV infection (11.9%) was reported in CP children. Only 6.3% of children with Down syndrome were HBsAg positive. In other studies including a study in 1999 in Belgium¹⁶ and in 2000 in Spain¹⁷, the duration of being institutionalized was reported as a risk factor of HBV infection. In our study, although no significant association was observed between positivity of HBsAg and the duration of being institutionalized, the highest HBV infection rate (28.5%) was observed in children with longest period of being institutionalized (10-11 years). In a similar study in 2004 in Brazil¹⁸, duration of being institutionalized and multiple admissions in institutions were reported as the major risk factors for increased prevalence of HBV among institutionalized mentally retarded children.

In this study, no significant relationship was observed between history of vaccination and positivity of HBsAg and in contrary to our expectations, we noticed a higher infection rate in vaccinated children comparing non-vaccinated children (7.8% to 3.5%). This is probably due to the infection of these children with mutant strains of HBV that could be resistant to immune response and vaccine. A study in 1998 in Singapore¹⁹ showed that mutation in HBsAg happens more (in number and severity) in vaccinated children comparing non-vaccinated children.

In the only study in Iran, which was done in 2003¹⁰, the prevalence of HBV infection among mentally retarded children was reported 6%. In the present study, 8% of mentally retarded children were HBsAg positive. Despite a dramatic improvement in people's health condition and the implementation of HBV

vaccination program for children in this period, this shows an increase in HBV infections in 10 years.

According to these results, the prevalence of HBV infection in these children is even more than some high-risk populations such as blood recipients^{20,21} or intravenous drug users. In studies in 2008²² and 2010²³ in Iran, HBV infection in intravenous drug users was reported 6% and 5.8% respectively, which has decreased to 3.2–3.3% nowadays^{24,25}. This decrease is due to education and executing preventive measures in intravenous drug users²³. It seems that specific conditions of children with mental retardation, particularly their special isolation and poor health situation have resulted in an increased incidence of HBV infection among them, despite the vaccination program done by ministry of Health.

Conclusion

According to the results of our study, it is essential to change some health policies in mentally retarded children in Iran to reduce HBV infection among this high risk population. More attention should be paid to these children and other studies like measurement of HBsAb and evaluation of immune response to HBV vaccine in these children should be done in next steps. In addition, identification of mutations in hepatitis B surface gene, which can be a cause for escape from immune response to vaccination, has an important role. This subject is helpful in finding the causes of the high HBV infection rate among the population and the consequent control of HBV infection.

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