Gastroenterology and Hepatology From Bed to Bench.
2024 **RIGLD**, Research Institute for Gastroenterology and Liver Diseases

ORIGINAL ARTICLE

p-ISSN: 2008-2258 e-ISSN: 2008-4234

To vaccinate or not: hepatitis a seroprevalence in institutionalized patients with intellectual disability

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ABSTRACT

Aim: Our goal was to assess the need for vaccination and preventive measures in this vulnerable population.

Background: HAV is the most common form of acute viral hepatitis, transmitted primarily via fecal-oral route. Therefore, poor hygiene and close contact among institutionalized people are associated with higher HAV infection prevalence. We sought to determine the seroprevalence of anti-HAV antibodies among institutionalized individuals with intellectual impairments in light of Iran's falling trend in HAV antibody prevalence.

Methods: In this cross-sectional study, we evaluated the seroprevalence of total and IgM anti-HAV antibodies of 254 institutionalized people with intellectual disabilities. Total and IgM anti-HAV antibodies of the blood samples of these people were determined by ELISA method.

Results: The seroprevalence of total and IgM anti-HAV antibodies among institutionalized people with intellectual disability were 15.4% and 0.4% respectively. In comparison to other institutionalized patients, individuals who were elderly and had spent more time in the institutions exhibited a higher prevalence of anti-HAV antibodies (p-values= 0.011 and <0.001, for example).

Conclusion: Based on our study, intellectually disabled people have a low prevalence of anti-HAV antibodies, which increases with age and the duration of institutionalization. Therefore, vaccination is necessary to prevent serious infection in these people.

Keywords: Hepatitis A, Anti-HAV, Prevalence, Intellectual disability, Institutionalization.

(Please cite as: **Hosseini-Monfared P, Arjmand G, Vaezjalali M. To vaccinate or not: hepatitis a seroprevalence in institutionalized patients with intellectual disability. Gastroenterol Hepatol Bed Bench 2024;17(4):409-414. https://doi.org/10.22037/ghfbb.v17i4.2984).**

Introduction

Hepatitis A, caused by the hepatitis A virus (HAV), is the most common form of acute viral hepatitis in the world (1). Acute hepatitis caused by HAV affects about 1.5 million people annually (2). HAV belongs to the Hepatovirus genus within Picornaviridae family (3). The clinical manifestations of HAV infection are diverse, ranging from asymptomatic infection to acute liver failure and mortality (4). The disease's severity is contingent upon age. The majority of infections in minors are asymptomatic, while adult infections are more likely to lead to icterus, fulminant hepatitis, and mortality (5). The mean incubation time of Hepatitis A is about 30 days, with symptomatic cases presenting with the nonspecific prodromal symptoms like fever, weakness, and abdominal discomfort. Dark urine and jaundice develop within a few days to a week (6).

The main route of transmission is fecal-oral, mostly person-to-person among family members, people in institutions, and other close contacts (e.g. sexual contacts). Ingestion of food or water contaminated with fecal matter containing HAV is another way of transmission (7). The majority of individuals in low-income countries with inadequate socioeconomic and sanitary conditions contract the disease during childhood and frequently remain asymptomatic. On the other hand, as sanitary conditions improve, people acquire the disease at older ages when it is more severe. (8). HAV vaccinations are not necessary in

Received: 20 May 2024 *Accepted*: 27 July 2024
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underdeveloped nations where hepatitis A is hyperendemic because infection with HAV usually results in the lifelong immunity (9).

Because of their poor hygiene practices, institutionalized people with the intellectual disabilities are thought to have a higher risk of acquiring hepatitis A (10). Although prior research in Iran found a high HAV seroprevalence and no need for vaccination, more recent studies found a reduced incidence of HAV seroprevalence and a need for immunization owing to improving hygienic and economic circumstances (11, 12). We aimed to measure the seroprevalence of anti-HAV antibodies and the need for vaccination in the institutionalized people with intellectual disabilities in terms of the reduction of HAV seroprevalence in Iran during recent years, and higher risk of HAV infection in this group of people.

Methods

Study design

In this cross-sectional study, a total of 254 people with intellectual disabilities who were institutionalized in 5 centers in Tehran, Iran were evaluated. The five centers were chosen from Tehran's various geographic areas. The identities of the centers have been anonymized throughout the text to maintain confidentiality and safeguard the privacy of the collaborating institutions. Inclusion criteria were considered the patients who were institutionalized in these care centers. Exclusion criteria were the patients with a history of immunological disorders or use of immunosuppressive drugs. Blood samples were collected from the residents of these institutions in July 2013. The institutional review board's approval was obtained. Informed consent was gained from all participants. Parents or legal guardians provided signed approval for children ≤15 years of age.

Data was collected using a questionnaire by a research assistant who was also blinded to the study. The questionnaire included inquiries regarding fundamental demographic information, including the number of nurses, the duration of residence in the institution, and the age and gender of the respondents. Five mL of venous blood was drawn from each participant. The sera were separated and stored at -20°C until tested for anti-HAV immunoglobulins. Total anti-HAV immunoglobulins, and immunoglobulin M (IgM) against HAV were determined using commercial kits based on the enzyme-linked immunosorbent assay (ELISA). ELISA procedure was performed based on the manufacturer's protocols (Dia. Pro Diagnostic Bioprobes, Milan, Italy).

Sample size calculation

The sample size calculation was performed using a previously reported prevalence of anti-HAV antibodies among a similar population in Tehran (13) and using following formula (14):

$$\text{Sample size} = \frac{Z_{1-\alpha/2}{}^2 p(1-p)}{d^2}$$

Table 1. Demographic data of the patients

Variables	Number (%) or Mean ± SD
Age groups, year (%)	
≤ 5	40 (15.7)
6-10	66 (26.0)
11-15	110 (43.3)
16-20	32 (12.6)
21-25	4 (1.6)
≥ 26	2 (0.8)
Gender, n (%)	
Male	137 (53.9)
Female	117 (46.1)
Duration of Institutionalization (years)	4.39 ± 3.18
Institutions	
Center A	64 (25.2)
Center B	58 (22.8)
Center C	48 (18.9)
Center D	43 (16.9)
Center E	41 (16.2)

Considering a type I error of 5% (Z1-α/2=1.96), an absolute error of 5% (d), and an expected prevalence of 80.3% based on a previous study (13), it was indicated that our study required at least 243 patients.

Statistical analysis

Quantitative variables were presented as mean ± standard deviation (SD), and qualitative variables were presented as percent (%). Kolmogorov–Smirnov test was used to determine if the data distribution was normal. The means of continuous variables were compared between two independent groups using the Student's t-test. Categorical data were compared using chi-square test and Fisher's exact test. A Kruskal-Wallis H test was used to compare anti-HAV antibody prevalence among age groups. All the statistical analyses were performed using IBM SPSS Statistics version 26 and GraphPad Prism version 8 (GraphPad Prism Software Inc., Boston, MA, USA) for Windows. P values < 0.05 were considered statistically significant.

Results

We evaluated 254 people with intellectual disabilities who were institutionalized in five care centers in the city of Tehran. None of included patients were vaccinated against the HAV. The mean age of participants was 11.05 ± 5.01 and the maximum age was 30. The demographic data of patients are summarized in Table 1.

Total anti-HAV antibody

Total HAV antibodies were detected in 39 patients (15.4%) in our cohort population. The mean age of individuals who tested positive for total anti-HAV antibodies was statistically significantly higher than that of those who received negative results. A Kruskal-Wallis H test showed that there was a statistically significant difference in total anti-HAV antibodies among different age groups (H (2) = 10.99, p = 0.012) (Figure 1).

Furthermore, the duration of stay at the institutions was significantly higher in the patients who had positive total anti-HAV antibodies (Table 2). There was not a significant difference in the seroprevalence of anti-HAV antibodies between the genders (p-value=0.736). Hence, the seroprevalence of anti-HAV was not significantly different in the five centers (Table 2).

Table 2 Comparison of Age and Duration of institutionalization between patients with positive and negative anti-HAV antibody tests

IgM anti-HAV antibody

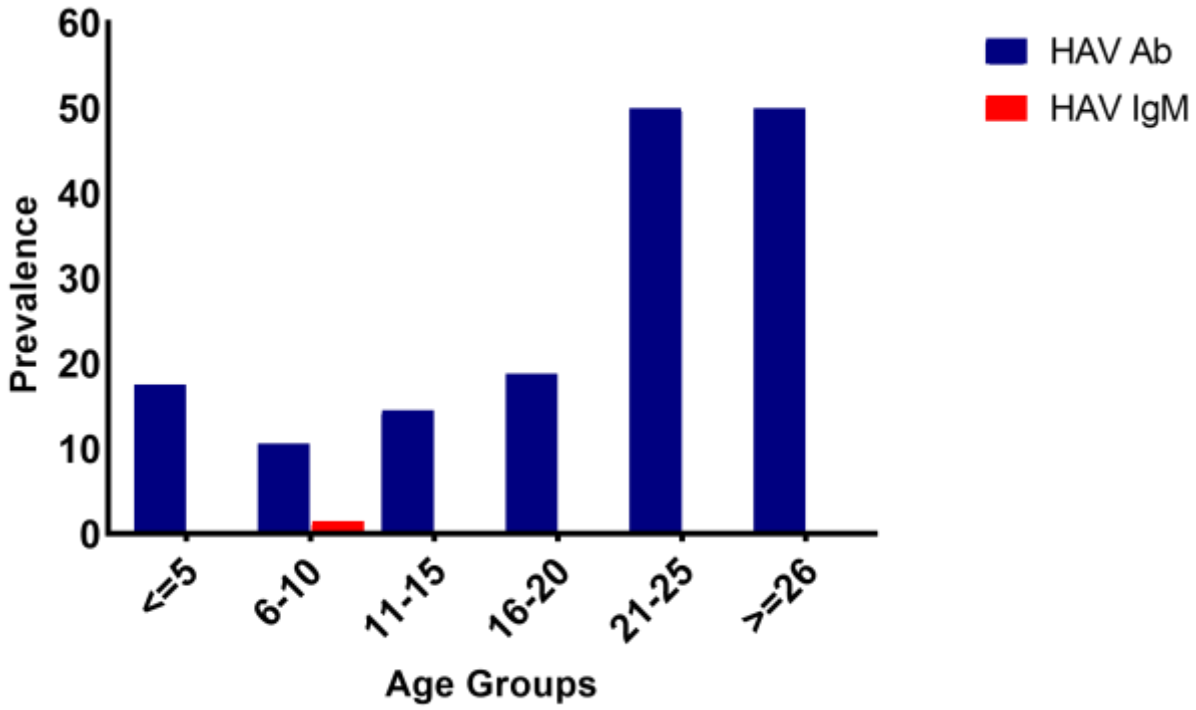

Figure 1. Total anti-HAV antibody and IgM anti-HAV antibody prevalence in different age groups

Table 1. Comparison of Age and Duration of institutionalization between patients with positive and negative anti-HAV antibody tests

Variables	Anti-HAV antibody		p-value
	Positive	Negative	
Age	12.10 ± 6.35	10.86 ± 4.71	0.011*
Gender			
Male	22 (16.1%)	115 (83.9%)	0.736
Female	17 (14.5%)	100 (85.5%)	
Duration of Institutionalization (years)	5.85 ± 3.85	4.13 ± 2.97	<0.001*
Institution			0.196
Center A	5 (7.8)	59 (92.2)	
Center B	11 (19.0)	47 (81.0)	
Center C	7 (14.6)	41 (85.4)	
Center D	6 (14.0)	37 (86.0)	
Center E	10 (24.4)	31 (75.6)	

* Significant values

One patient (0.4 %) was positive for IgM antibody against HAV in our study. The patient was a 7-year-old female who was staying at the institution for 3 years due to mental disability. She did not have any symptoms related to the acute hepatitis.

Discussion

The seroprevalence of total anti-HAV antibodies and anti-HAV IgM antibodies in the institutional children with intellectual disabilities were 15.4 % and 0.4 %, respectively in our study. The incidence of total anti-HAV antibodies shown a favorable correlation with advancing age and duration of institutionalization. The prevalence of anti-HAV antibodies in Iran was differently published across various regions and age groups. The seroprevalence of anti-HAV antibodies among healthy population in Iran was reported to range from 11% to 91% based on the geographical area of sampling (15-22). This heterogenicity is explained by the socio-economic state of the studied cities and their different hygienic status. Other studies reported similar intra-country variations in the seroprevalence of anti-HAV antibodies (23, 24). We witnessed an increase in seroprevalence associated with the increasing age of people, as reported in earlier studies (25). This phenomenon is explained as the time that a person was at risk of getting infected, increases with getting older.

It is hypothesized that the seroprevalence of anti-HAV antibodies would be higher in institutionalized individuals who have more contact with one another and also have lower hygiene standards, as feces-oral transmission is the primary route of HAV infection. Previous studies reported higher anti-HAV antibodies among the overcrowding populations like people in an army or prisoners (26).

It was reported that in terms of poorer hygiene status in the people with intellectual disabilities, the prevalence of HAV infection is higher in this special population (26). Studies conducted on HAV infection in institutions for individuals with intellectual disabilities have revealed a markedly higher prevalence of anti-HAV antibodies in this population (27, 28). Another study in Ireland showed that people with intellectual disabilities living in an institution or a community-dwelling have a significantly higher prevalence of anti-HAV antibodies (29).

The seroprevalence of anti-HAV antibodies in the children and young patients under 23 was reported to be 6 percent among the healthy population of Tehran, Iran (30). In contrast to the reported prevalence in the healthy population of Iran, our study revealed a higher prevalence of anti-HAV antibodies in institutionalized individuals with mental disabilities. Individuals with intellectual disabilities necessitate specialized care and attention. The guidelines for anti-HAV vaccination should consider the differences in HAV infection prevalence in this group of people and attempt to reduce the risk of severe hepatitis in this population and the nurses and other people who take care of these people.

This study had some limitations, the samples were only from the city of Tehran and to have a better estimation of the seroprevalence of anti-HAV antibodies among the institutionalized people with intellectual disabilities in Iran, samples from all over the country are needed.

Conclusion

Our study revealed a low prevalence of anti-HAV antibodies among people with intellectual disabilities. The prevalence of anti-HAV antibodies increased with increasing age and duration of institutionalization. Consequently, anti-HAV immunization is necessary to prevent severe HAV infection in this community of institutionalized individuals with intellectual disabilities.

Conflict of interests

The authors declare that they have no competing interests.

Ethical approval

The institutional review boards of Shahid Beheshti Medical University approved this study (IR.SBMU.MSP.REC.1400.371).

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