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Prevalence of HAV IgM marker of Hepatitis A virus among patients of all Ages in Diyala province/Iraq

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Abstract

The most prevalent viral infection that causes hepatitis is hepatitis A virus (HAV), which continues to be a worldwide health issue for both developed and underdeveloped nations. By calculating the rate of HAV IgM positive, the current study sought to determine the prevalence of HAV infections among patients in the province of Diyala. In the present study, a total of 180 blood specimens were collected from patients, who referred to diagnostic individuals in Diyala Province, Iraq from October /2022 till Agust 2023. The presence of HAV in the specimens was investigated using ELISA technique. The results of the current study revealed that the overall positivity rate of HAV IgM was 13.3%. HAV IgM positivity was higher among 1-2 years old group. While, it was insignificantly higher among females compared to males (54.2%). Furthermore, HAV IgM positivity rate was insignificantly higher among Rurales compared to urbans (58.3%, 41.7%). Additionally the results showed that HAV IgM positivity rate among those used unsterilized water (70.8%) was significantly higher than that sterilized water (29.2%). Moreover, the results found that those with un vaccinated with HAV vaccine had significantly higher (79.2%) HAV IgM positivity rate. The present study founded that it is important to increase our knowledge about the frequency of HAV infections among patients and early diagnosis of HAV infections is essential in community for infection control.

Key word: Hepatitis A virus, IgM, ELISA, Prevalence and Diyala.

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انتشار مؤشر HAV IgM لفيروس التهاب الكبد A بين المرضى في محافظة ديالى / العراق

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الخلاصة

إن العدوى الفيروسية الأكثر انتشارًا التي تسبب التهاب الكبد هي فيروس التهاب الكبد A (HAV) ، والذي لا يزال يمثل مشكلة صحية عالمية لكل من الدول المتقدمة والنامية. من خلال حساب معدل HAV IgM الإيجابي ، هدفت الدراسة الحالية إلى تحديد مدى انتشار عدوى HAV بين مرضى محافظة ديالى. في هذه الدراسة ، تم جمع ما مجموعه 180 عينة دم من المرضى الذين تم تحويلهم إلى المستشفى للتشخيص في محافظة ديالى ، العراق من تشرين الأول / أكتوبر / 2022 حتى آب / أغسطس 2023. تم الكشف عن وجود فيروس التهاب الكبد A في العينات باستخدام تقنية ELISA. أوضحت نتائج الدراسة الحالية أن معدل الإيجابية الكلية لـ HAV IgM كان 13.3٪. كانت إيجابية HAV IgM أعلى بين مجموعة 1-2 سنوات. بينما كانت أعلى بشكل غير معنوي بين الإناث مقارنة بالذكور (54.2٪). علاوة على ذلك ، كان معدل إيجابية HAV IgM أعلى بشكل ضئيل بين المناطق الريفية مقارنة بالمناطق الحضرية (58.3٪ ، 41.7٪). بالإضافة إلى ذلك أظهرت النتائج أن معدل إيجابية HAV IgM بين أولئك الذين استخدموا المياه غير المعقمة (70.8٪) كانت أعلى بكثير من تلك المعقمة (29.2٪). علاوة على ذلك ، وجدت النتائج أن أولئك الذين لم يتم تطعيمهم بلقاح HAV لديهم معدل إيجابي أعلى بكثير (79.2٪) من HAV IgM. أوضحت الدراسة الحالية أنه من المهم زيادة معرفتنا حول تواتر الإصابة بعدوى فيروس التهاب الكبد الوبائي بين المرضى والتشخيص المبكر لعدوى فيروس التهاب الكبد الوبائي هو أمر ضروري في المجتمع للسيطرة على العدوى.

الكلمات المفتاحية: فيروس التهاب الكبد A، IgM، الاليزا، الانتشار ومحافظة ديالى.

Introduction

Hepatitis A virus (HAV) is the cause of hepatitis A, which is an inflammation of the liver. When an uninfected (and unvaccinated) individual consumes food or water that has been contaminated by an infected person's faeces, the virus is most commonly disseminated. Oral-anal sex, contaminated food or water, poor personal hygiene, and inadequate sanitation are all risk factors for the illness [1].

HAV is an RNA virus with only one strand. The virus multiplies in the liver and is expelled in bile following infection, which typically occurs by fecal-oral transmission. By means of certain plasma membrane receptors, HAV reaches the hepatocyte [2]. The liver has an immune reaction that intensifies liver damage by causing portal and periportal lymphocytic infiltration. Only a few occurrences have been associated with blood transfusions and mother-to-fetus vertical transmission [3]. The 14–21-day anicteric prodromal, when fecal and serum virus concentrations are high, is when HAV transmission is at its peak. In general, the incubation phase lasts between two and six weeks, with a 28-day average. For up to three weeks, fecal viral excretion can continue. Five to ten days after exposure, serum IgM anti-HAVantibodies can be found for the first time [4]. According to epidemiological data, the geographic distribution of HAV infection varies according to hygienic and sanitary circumstances as well as other socioeconomic development variables [5]. Children exhibit the least amount of the HAV infection's clinical manifestation, which is age-dependent [4]. Children are a crucial component in the spread of HAV. One indicator of the epidemiological patterns of HAV and viral transmission throughout the population is the seroprevalence of anti-HAV antibodies by age group [6].

HAV infection is less common when there is a drop in the seroprevalence of HAV antibodies in a community, especially in children [7]. According to seroepidemiological findings, some of the hyperendemic nations have transitioned to reduced infection rates. For assessing HAV seroprevalence, the WHO suggests using two different approaches. Both techniques rely on the detection of anti-HAV IgG antibodies to determine HAV endemicity in nations where the majority of the population has not had a HAV vaccination [8].The first technique relies on estimating the prevalence of HAV over the entire population, whereas the second way takes an individualised approach based on age [4]. For the first technique, the prevalence of HAV is divided into three categories: high, defined as more than 50% of the population; intermediate, defined as between 15% and 50%; and low, defined as less than 15% of the population [9]. The second technique divides the endemicity into four categories: high (90% by 10 years old), moderate (50% by 15 years old, with 90% by 10 years old), low (50% by 30 years of age, with 50% by 15 years of age), and extremely low (50% by 30 years old). The age-specific technique offers a more accurate assessment of seroprevalence [10]. Most of Africa, Asia, Central America, and South America are among the regions that have a high endemicity. Household overcrowding, limited water supply, and poor sanitation in these places are factors that aid in the spread of the virus between young children. Iraq is thought to be a highly endemic region [8]. Contrary to the towns with high rates of hepatitis A, where the majority of cases affect children under the age of 15, the illness affects children, adolescents, and young adults in the three communities with moderate rates. Early childhood virus exposure has reduced as socioeconomic conditions and their effects have improved [11]. Immunization against HAV can prevent infection, and HAV vaccine can be used as prophylaxis before and after exposure to the virus. The two primary obstacles to implementing a HAV vaccination campaign are practicality and affordability. As with other diseases that are preventable by vaccination, prevention techniques rely on the epidemiological traits of HAV infection in the given nation [8]. Age-specific and periodical seroprevalence information are not available nationally for Iraq, and the unique epidemiological characteristics of HAV infection are unknown. According to the WHO, Iraq has a hyperendemic (96.4%) hepatitis A infection rate, and the number of cases has increased considerably. Hepatitis A and E viruses proliferate because of a variety of circumstances, including poor hygiene, contaminated food, and contaminated water [12].

Methods

Patients and Blood specimens' collection

This research included 180 hepatitis A patients in total. (1-2) years to greater than 5 years was the age range, and the majority were female (58.9% against 41.1%). Age, sex, place of residence, source of drinking water, and hepatitis A vaccination status were all pre-recorded on a particular questionnaire. Short one-to-one patient interviews were used to gather the information.

Each participant provided five milliliters of venous blood, which was drawn using five milliliter sterile, disposable plastic syringes. After the samples were prepared, they were collected and stored at -20 C until use.

Detection of HAV by ELISA Method

Hepatitis A virus IgM detection was performed on blood samples employing the ELISA technique using an ELISA kit from Dia.Pro/Italy.

Statistical analysis

All parameters were represent as numbers percentages, and Pearson-Chi-square test was detected to reveal significant differences in frequency. $P \leq 0.05$ was measured significant. Our data were analyzed using SPSS v. 21.0 statistical software.

Results

Detection of Hepatitis A virus by serological marker

Table 1 revealed that the HAV IgM positivity rate among patients were 13.3% with statistically significant difference ($P<0.001$***).

Table 1: Positivity rate of HAV IgM serological marker.

MARKER	STATUS	NO.	%	*P* VALUE
HAV-IgM	**Positive**	24	13.3%	P<0.001***
	Negative	156	86.7%	

*Significant difference between proportions using Pearson Chi-square test at under 0.05 level.

Distribution of HAV IgM positivity rate According to demographic factors

The distribution of HAV IgM positivity rate according to the age, gender and residence showed that insignificant differences (P>0.05). About the source of drinking water, the HAV IgM positivity rate among those used unsterilized water (70.8%) was significantly higher than that who sterilized water (29.2%), (P<0.001***). In regard to the vaccination with HAV vaccine, the results found that those with un vaccinated had significantly higher (79.2%) HAV IgM positivity rate (P<0.001***). All these details were shown in table 2.

Table 2: Distribution of HAV IgM positivity rate according to demographic factors.

Variables	HAV_IgM positivity rate		*p* value
	Yes	No	
	No. (%)	No. (%)	
Age (years)			
1-2	65 (41.7%)		p>0.05
	10 (41.7%)		
<5	9 (37.5%)	73 (46.8%)	
>5	5 (20.8%)	18 (11.5%)	
Gender			
Male	11 (45.8%)	63 (40.4%)	p>0.05
Female	13 (54.2%)	93 (59.6%)	
Residence			
Urban	10 (41.7%)	75 (48.1%)	p>0.05
Rural	14 (58.3%)	81 (51.9%)	
Source of drinking water			
Sterilized	7 (29.2%)	126 (80.8%)	p<0.001***
Unsterilized	17 (70.8%)	30 (19.2%)	
Vaccination with HAV vaccine			
Vaccinated	5 (20.8%)	95 (60.9%)	p<0.001***
Un vaccinated	19 (79.2%)	61 (39.1%)	

*Significant difference between proportions using Pearson Chi-square test at 0.05 level.

Discussion

In order to effectively manage infection at the community level in Iraq, it is crucial to measure the seroprevalence of the Hepatitis A virus there [13].

The results of the current research showed a 13.3% HAV IgM positive rate, which contrasts with those of other studies carried out in Iraq, which showed positivity rates of 96.4%, 21.7%, 68.3%, and 78.6%, respectively [14] [15] [13] [16]. However, studies conducted in various parts of the world have revealed varying HAV IgM positivity rates. For example, Iran [17] reported a HAV IgM rate of 93.2%, India [18] reported a rate of 50.59%, and Turkey [19] reported a rate of 0.2% for HAV IgM seropositivity.

The fecal-oral pathway is the main method that the hepatitis A virus spreads, and immunization with the HAV vaccine together with health education for bettering sanitation is the most effective strategy to manage the illness in an endemic region [20]. The variations in the findings between research might be attributed to the viral serum load, sensitivity and specificity of the

ELISA technology used, sample size, and geographic location. Poor socioeconomic standing may also be to blame for this discrepancy, which may have led to increased rates of HAV infection in certain nations. Additionally, factors contributing to the increasing frequency of HAV infection include increased levels of hygiene, non-compliance with HAV immunization usage, and others [21] [16].

According to the study's findings, the prevalence of HAV IgM positive in children under 5 years of age was negligible. These findings were in line with those of earlier research conducted in Iraq [15][13]. Additionally, results from international research were in agreement with the current findings [22] [23] [17] [19]. The most affected age group was those under two years, and the current investigation discovered that HAV was the main cause of hepatitis infection in children under the age of five. The persistence of HAV infection in certain newborn nurseries, the high incidence of nosocomial HAV infection in hospitals, as well as waterborne outbreaks, as HAVs are resistant to chlorination, were likely the most frequent causes of HAV infection [21]. Low health awareness, poor personal cleanliness, tainted food and water, tainted children's toys, and failure to comply with HAV immunization usage are some of the variables that may contribute to the spread of HAV among these age groups [24].

Another finding in the current study showed that females (54.2%) had the insignificantly higher distribution positive rate for HAV IgM. Other research [22] [25] [23][17] [19] [15] [13] [16] revealed that there were no significant differences in the present data, indicating that both sexes were exposed to an equal risk of infection in the current study groups.

The current research founded that rural areas had higher distributions of HAV IgM positive than urban areas. This is consistent with research by [26] [17] [16] and others. Rural areas see a higher prevalence of human waste, although sewage treatment in metropolitan areas is nearly always adequate. These streams are the primary source of disease in the human population and agricultural irrigation. According to the current research, which is in line with other studies, these waters serve as the primary irrigation supply for agriculture and, in the event of contamination, serve as a source of infection for the public [26] [16].

Other studies [27] [28] [16] [29] have noted the significance of the HAV IgM positive rate in relation to the source of drinking water. Individual water systems that used wells with untreated ground water were most frequently connected to reported cases of hepatitis A infection related with drinking water. There were only two reports of environmental and recreational prevalence, indicating that untreated drinking water is a more typical waterborne exposure route for hepatitis A [30].

Other research [27] [28] [16] [29] have emphasized the importance of the HAV IgM positive rate in connection to the source of drinking water. The majority of reported cases of hepatitis A infection associated with drinking water were associated with specific water systems that used wells with untreated ground water. Since there were only two reports of environmental and recreational prevalence, contaminated drinking water is likely to be the most common waterborne exposure route for hepatitis A [30].

The current findings might be explained by the fact that unvaccinated patients who live in rural areas or who are older than 15 may have internal health issues and low socioeconomic level, which could have led to a greater frequency of HAV infection.

Conclusions

According to the results in the present study, the Diyala province still in the intermediate zone of endemicity for the hepatitis A virus infection. Due to people responsible for health in the Diyala province must monitor programs to prevent transmission of the HAV, which can be done in several ways.

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