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Analysis of Hepatitis A Virus (HAV) Infection in Eastern of Baghdad, Iraq

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ABSTRACT (10 PT)

Hepatitis A virus (HAV) is a prevalent viral infection in Iraq, making it crucial to determine its asymptomatic presence for effective community-level infection management.The aim of this study was to determine the seroprevalence of HAV in a nationally representative population in eastern Baghdad, Iraq, to identify variables associated with seropositivity, and to assess changes in the epidemiological pattern.This study was conducted from January 2023 to July 2023. Patients aged 1-45 years were randomly sampled. HAV immunoglobulin M (IgM) levels were measured, and data on sex, place of residence, and age were collected. A total of 371 subjects (199 male and 172 female) participated in the study. The overall seroprevalence of HAV IgM was highest in the age groups 1-4 years (59.42%) and 5-14 years (62.59%), while 46.15% and 60.38% of patients were in the age groups <1 year and 15-45 years, respectively. The distribution of HAV was higher in males (62.21%) compared to females (58.79%), indicating , a substantial difference between male and female HAV infected individuals.

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1. INTRODUCTION

Globally, viral hepatitis remains a significant public health concern. With advancements in technology, eight different types of hepatitis viruses have been identified: hepatitis A, B, C, D, E, G, TT, and SEEN [1].One of the main causes of acute viral hepatitis worldwide is hepatitis A (HAV), which spreads through the fecal-oral route[2]. While some individuals with hepatitis A may die from the disease, others may fully recover due to lifelong immunity .Hepatitis A is primarily spread through contaminated hands, water, poor sanitation, and personal hygiene practices [3].Children play a significant role in the transmission of HAV. The seroprevalence of anti-HAV antibodies by age range can be used as an indicator of the epidemiology of HAV and viral spread in the population[4].

Evidence of past infection is almost always present in developing countries, such as Asia, Africa, and South America. In contrast, low infection rates are found in industrialized nations like the United States, Canada, and Europe. High-risk populations in these areas include injectable drug users, homosexuals, tourists to endemic disease areas, and residents of isolated communities like nursing homes [5].Hepatitis A has become a major public health issue in several Middle Eastern countries, including Iraq [6].Iraq has seen a rise in hepatitis A cases according to the World Health Organization[7].

The Ministry of Health in Iraq has prioritized regular monitoring of hepatitis to enhance medical staff's ability to manage patients. The surveillance system includes medication provision, diagnostic services, and immunization accessibility [8].

Local communities may suffer significant economic and social consequences due to the disease, impacting individuals' ability to return to work, school, or normal life. The availability of clean water and improved socioeconomic conditions have led to a decline in HAV seroprevalence and increased immunity among sensitive individuals[9].Iraq's internal issues and low socioeconomic standing 15 years ago may have contributed to a greater frequency of HAV infection. However, when socioeconomic conditions and availability to drinkable, safe water improved over the ensuing year, HAV seroprevalence declined and a higher percentage of sensitive individuals were secured against infection of HAV [10].

Scientific research suggests that two doses of the inactive vaccine can provide lifetime immunity against HAV [11]. Symptoms of HAV are more common (30%) in children under 6 years old, with symptoms lasting weeks in older children [12].HAV is frequently spread by tainted food and water. In developed nations, isolated incidences of HEV and HAV do occasionally occur. Persons who keep dogs at house or often eat meat of liver are found to have both HAV and HEV concurrently. [13].Hepatitis virus may often enter liver cells without causing any harm to the cells. As a result, the immune response plays a crucial role in preventing the virus from spreading and is in charge of the inflammatory processes that lead to liver pathogenesis [14].

Serologic testing for HAV(IgM) antibodies and polymerase chain reaction PCR testing for viral RNA are used to diagnose acute HAV. Soon after infection, immunoglobulin G (IgG) anti-HAV appears and persists throughout the person's lifespan. [15].Co-infection with HAV and HEV is rare in humans and animals. Approximately 20% of hepatic infections are not linked to hepatitis viruses A-E and may be caused by other viruses [16].Our study aimed to determine the seroprevalence of HAV in a nationally representative population in eastern Baghdad, Iraq, examine factors related to seropositivity, and assess changes in the epidemiological trend.

2. METHOD

Blood samples were collected from 371 patients who attended the Eastern Baghdad Health Centre and Laboratory for Public Health , patients displaying digestive symptoms such an eating disorder, vomiting, nausea, stomach discomfort, lethargy, malaise, fever, and dark coloured urine. Surveys were conducted to gather information on age, residence, and sex. Each patient's sample was drawn from a vein and around 5 cc of serum was separated and stored at -20°C until testing. Total anti-HAV was measured using the HAV IgM ELISA Test Kit by DIALAB GmbH. Statistical analysis was performed using the SAS(18) program to determine the impact of various factors on research parameters.In our study, a significant comparison between percentage (0.05 and 0.01 likelihood) was made using the Chi-square test [17].

3. RESULTS AND DISCUSSION

Table 1 illustrates the 371 patients among whom there was a clinical suspicion of acute viral hepatitis. 60.38% tested positive for serum anti-HAV antibodies. Participants were categorized into four age groups: <1, 1-4, 5-14, and 15-45 years. This study showed that the 5-14 years age group had a significant incidence of infection (Table 1).

Table (1) Seroprevalence of Anti-HAV among different age groups

Age group (years)	**Total tested No.**	**HAV positive No.**	**%**	**HAV Negative No.**	**%**	**p-value**
< 1	**13**	**6**	**46.15**	**7**	53.85	0.802 NS
1-4	**69**	**41**	**59.42**	**28**	40.58	0.035 *
5-14	**262**	**164**	**62.59**	**98**	37.41	0.0084 **
15-45	**27**	**13**	**48.15**	**14**	51.85	0.873 NS
Total	**371**	**224**	**60.38**	**147**	39.62	0.0061 **
* (P≤0.05), ** (P≤0.01).						

Males had a higher gender-specific prevalence of the hepatitis virus than females. Specifically, male and female HAV distributions were 62.21% and 58.79%, respectively (Table 2).

Table (2) HAV Seropositivity & sex difference

Sex	Total tested No.	HAV positive No.	%	HAV Negative No.	%	P-value
Male	**172**	**107**	**62.21**	**65**	**37.79**	**0.0006 ****
Female	**199**	**117**	**58.79**	**82**	**41.21**	**0.0027 ****
Total	**371**	**224**	**60.38**	**147**	**39.62**	**0.0008 ****

** ($P \leq 0.01$).

The frequency of positive IgM HAV increased according to the center of primary health care in Sabaa Qusur, Amalkuber, UR, and Shaab, and was lowest in Kamalya, Bub alsham, Baladyat, Maghreb street, and Palestine street (Table 3).

Table (3) distribution of HAV cases according to the center of primary health care catchment areas eastern of Baghdad.

District area	Total Patients No.	%	Male positive No.	female positive No.
Bub alsham	**5**	2. 2	**2**	**3**
Talbya	**16**	7.14	**8**	**8**
Amalkuber	**38**	16.94	**18**	**20**
Kamalya	**5**	2. 2	**3**	**2**
Maghreb street	**8**	3.57	**5**	**3**
Palestine street	**8**	3.57	**3**	**5**
Benook	**17**	7.58	**7**	**10**
Baladyat	**5**	2. 2	**4**	**1**
Hussinya	**19**	8.48	**9**	**10**
Shaab	**25**	11.16	**12**	**13**
Ur	**36**	16	**16**	**20**
Sabaa Qusur	**42**	18.75	**20**	**22**

The hepatitis A virus (HAV), which causes hepatitis A illness, spreads through the oral pathway via consumption of tainted food, contaminated water, or close interaction with an infected person (18). This study investigated the prevalence of HAV among various age groups in eastern Baghdad, Iraq. The results of this investigation demonstrate that, among 371 patients who attended public health laboratories, 60.38% had positive serum anti-HAV antibodies, compared to 96.4% reported in 2011 and 68.3% in 2022 [19].HAV seroprevalence fell, and more susceptible individuals were protected from HAV infection in the years that followed due to improved socioeconomic conditions and increased access to clean drinking water. Our findings indicate an intermediate-to-low endemicity of HAV in Iraq. Hepatitis A infection rates rise during times of conflict and are highly correlated with hygienic parameters [12].Our results are similar to a World Health Organization study in the Western Pacific Region [20].and a Jordanian study that discovered HAV endemicity dropped to a moderate degree [21].High seroprevalence of HAV has already been documented in numerous nations in the Eastern Mediterranean region,

with rates as high as 99% in Afghanistan and 93.7% in Palestine, and projected incidence rates below 50%, with the lowest frequency seen in Kuwait and the United Arab Emirates [22].

The majority of HAV patients in this research significantly belonged to the age categories of 1-4 and 5-14 years, with percentages of 59.42% and 62.59%, respectively, while 46.15% and 60.38% of patients were within the age groups of <1 year and 15-45 years. These findings were in line with a WHO research that revealed HAV infections are more prevalent in children in underdeveloped nations than in older age groups in industrialized countries (2). Additionally, an Iraqi research revealed that the majority of affected individuals were under the age of 10 and in their early infancy [7].Due to these factors, Iraq still has a high endemic status; however, due to the low incidence during infancy and growing incidence throughout the school years and the early teenage years, a move to an intermediate status is projected. However, our findings and those of other research show that HAV infection affects people of all ages, including children and elderly adults, in developing nations [23].

Males made up 62.21% of the sample in this study, which is consistent with several studies and reports from both developing and industrialized nations. These findings were in line with earlier research done in Iraq that discovered that men were substantially more likely than women to be HAV seropositive ($P<0.05$) [19].Contrary to earlier research in the Kingdom of Saudi Arabia, there were no significant differences between HAV-infected males and females [24].

The prevalence rate of positive IgM HAV antibodies was highest in the primary health care (PHC) centers of Sabaa Qusur, Amalkuber, UR, and Shaab. Poor personal hygiene and health education might be the main reasons for the increasing number of HAV cases [25].Since the inhabitants' access to drinking water is interrupted, they are forced to utilize electric pumps, which worsen water pollution by allowing floodwater to enter damaged or leaky water pipelines. In 73% of the areas in Baghdad with piped chlorinated water, low levels of chlorination were found, based on surveys conducted by the Ministry of Health in June and September of 2003. In governorates, 94% of the districts that were studied had low chlorination [26].

Our discovery of a link between HAV infection and hazardous water supply suggests that most of the geographic regions of Al-Sadr city's piped drinking water sources are seriously contaminated [27].The lowest level of HAV infection in Kamalya, Bub alsham, Baladyat, Maghreb Street, and Palestine Street may be due to high hygiene and health education programs.

4. CONCLUSION

In the last ten years, Iraq's hepatitis A seroprevalence has decreased, indicating a low to moderate endemicity of the virus. Although many people are still susceptible, the country needs to be immunized against the hepatitis A virus.

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