Epidemiological features of hepatitis A among children in Hodeidah, Yemen.

Abstract

Background : Hepatitis A virus infection is the most common cause of acute viral hepatitis, with approximately 1.5 million cases reported globally each year.

Objectives : The purpose of this study was to determine the incidence rate of hepatitis A infection, socio-economic indicators , and risk factors children of primary schools in Hodeidah, Yemen.

Methods: A cross-sectional study was conducted (from January to December 2019) among children at the 3 public primary schools (Al-nour , Asma'a Bint Abi Baker and Legislator's) in Al Hawak district , Hodeidah city ,Yemen.. 422 blood samples were collected from children (7 – 10 years old) . Hepatitis A was detected by enzyme linkage immunosorbent assay (ELISA) on serum specimens of children. Socio-demographic indicators were collected . . Statistical Package for the Social Sciences (SPSS) was used for data entry and analyses. The study was performed in Center of Tropical Medicine and Infectious Diseases (CTMID), of AL-Thawra Public Hospital Authority , Hodeidah, Yemen. Statistical Package for the Social Sciences (SPSS) was used for data entry and analyses.

Results : The results showed that 22/422 cases (5.2 %) were IgM positive and 400 /422 cases were negative. In addition , the results showed that a significant correlation between the hepatitis A infection and the socioeconomic indicators namely age, accommodation, income , education level of parents ($p < 0.05$), while non – significant correlation ($p > 0.05$) was recorded between the infection and the other indicators namely the sex only . On the other hand , risk factors that were statistically significant with hepatitis A infection including child who close contact with person with HAV infection (77.3%), child who do not practice personal hygiene (hand washing) after outside from bathroom (72.7%), child who have not special towels (68.2%) and child who share clothes with others (63.6%).

Conclusion

This study concluded low HVA infection among children of primary schools in Al- Hawak district, Hodeidah city , Yemen. The most risk factors of infection with HAV were close contact , poor sanitary conditions , house structure. and crowding in house.

Keywords: Hepatitis A virus, children, Primary Schools , Hodeidah, Yemen.

1. INTRODUCTION

Hepatitis A virus (HAV) infection is the most common cause of acute viral hepatitis, especially in children with approximately 1.5 million cases reported globally each year[(1)]. HAV spreads mostly via fecal oral route through contact with an infected person and ingestion of contaminated water or food[(2,3)]. HAV infection is often without symptoms in the early years of the life, but the severity of illness increases with increased age. In rare cases, HAV infection can cause liver failure and death, with mortality rates reaching nearly 2% in older adults[(4)].

HAV is single stranded, nonenveloped Ribonucleic acid (RNA) virus. It is acid resistant and thermostable[(1)]. According to the World Health Organization (WHO) estimates, HAV infection resulted in 13.7 million illnesses and 28000 deaths[(5)]. Safe water supply, food safety, hand washing, improved sanitation and the HAV vaccine are the most effective ways to combat the disease[(6)]. The incidence rate of HAV infection is strongly related to socioeconomic indicators and access to safe drinking water: as incomes rise and access to clean water increases, the incidence of HAV infection decreases. The association of HAV infection risk with standards of hygiene and sanitation, the age dependent clinical expression of the disease, and lifelong immunity determine the different patterns of HAV infection observed worldwide[(7,8)].

In less developed countries with very poor hygiene and sanitary conditions, HAV infection is highly endemic and most persons become infected in early childhood[(9)].Because infection occurs at an early age when the disease is often without symptoms, reported rates of the disease in these areas are relatively low and outbreaks are not common[(10)].

The infection is endemic in Africa except in south Africa. Moreover, Eastern Europe, Asia are at high risk of infection. In Yemen, A high prevalence of Immunoglobulin G (IgG) antibody (86.6%) against HAV was detected among participants in Aden Governorate, Yemen[11].

2.MATERIALS AND METHODS

2.1.Study area

This study was conducted at three public primary schools (Al-nour primary school, Asma bint Abi Baker elementary school and Legislator's primary school) in Al-hawak district, Hodeidah city selected Yemen country that is tropical region Hodeidah Governorate borders the Red Sea and is part of the narrow Tihama region. It serves as an important local port city. With a population of 2,687,674 and an area of 17,509 km². It contains 26 districts, three of them in the urban (Al Hali, Al Hawak and Al Meena districts), the remaining districts are in the rural areas. Hodeidah climate is semi tropical (warm and humid in the summer and moderate in winter). The highest temperature reaches 40 °C during the summer and the temperature in winter amounts to 24 °C ([12]).

2.3. Study design

This was a cross- sectional community based study conducted among students aged 7- 10 years at three public primary schools (Al-nour , Asma'a Bint Abi Baker and Legislator's) in Al Hawak district in Hodeidah city and the data were collected from parents of children . The study was done 1st April to 30th November 2019

Samples and data collection

About five ml of blood was collected in plain tube from each child, allowed to clot and centrifuges at room temperature. Then sera was separated and stored at -20°C till analyses. Pre-tested structured questionnaire were used for the interview. The questionnaire were divided into several sections: (A): child information (e.g. age, sex, education level); (B): socio-demographic characteristics of the parents of children, these include : education level , socioeconomic status , number of persons living in this household ; (C) :

knowledge about the source of drinking water and the mode of sewage disposal ; (D): knowledge and attitudes towards personal hygiene practices.

2.3. Hepatitis A analysis

The specific serodiagnosis is accomplished by examining anti-HAV antibodies of the IgM class, which are the main markers of acute infection with HAV. Generally, the detection of these antibodies is performed by enzyme immunoassay (sandwich assay), with several commercially available diagnostic kits [13]. HAV IgM was detected by enzyme-linked immunosorbent assay (ELISA) test namely designed for the qualitative detection of IgM antibodies to HAV in human serum[14].

2.4. Data analysis

Analyzed by using Excel 2016 and Statistical Package for the Social Sciences (SPSS) version 15 to calculate the descriptive analysis and Chi-squared test at $P = 0.05$ that were used to explore the epidemiological features of HVA infection among children in Hodeidah, Yemen.

3. RESULTS:

3.1.Socio-demographic characteristics of the studied children:

Out of 422 children, including 301 (71.3%) males and 121 (28.7%) females. The results found that 139 (32,9%), 142 (33.6%), 103 (24.4%) and 38 (9.0%) were in age groups of 7, 8, 9 and 10 years, respectively. This study showed that 358 cases (84.8%) of children were with low socioeconomic status (SES), while 64 (15.2%) of children with moderate SES. Most of them live in random houses (96.7%). In the current study, the number of persons in household (11-15 person) were 211 (50%) while the number of persons in household (6-10 person) were 191 (45.3%). Also this study obtained that 18 (4.3%) were with the illiteracy rate of the parents, but 208 (49.3%) of parents were with just read and write (Table1).

Table 1: Socio-demographic characteristics of the studied children, Al Hawak district, Hodeidah city , 2019.

Characteristics		N=422	%
Sex	Male	301	71.3
	Female	121	28.7
Age (years)	7	139	32.9
	8	142	33.6
	9	103	24.4
	10	38	9.0
Education level for parents	Illiterate	18	4.3
	Read and write	208	49.3
	Primary	39	9.2
	Secondary	97	23.0
	University	60	14.2
Socioeconomic status (SES)	Moderate	64	15.2
	Low	358	84.8
House structure	Random	408	96.7
	Apartment	14	3.3
Number of persons in household	≤5	20	4.7
	6-10	191	45.3
	11-15	211	50.0

3.2. Incidence rate of HAV IgM

The incidence rate of HAV IgM among children aged 7-10 years in Al-Hawak district, Hodeidah city is low 22 (5.2%) (Figure 1).

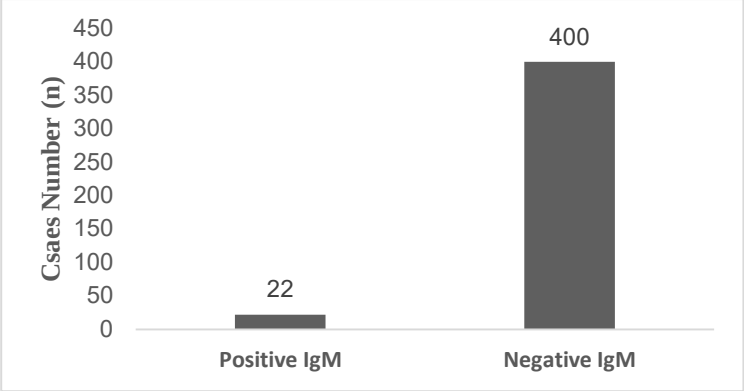

Figure 1 : Incidence rate of HAV IgM amongst children aged 7-10 years in Al Hawak district, Hodeidah city , Yemen, 2019.

3.3. Relationship between the socio-demographic characteristics and HAV IgM

HAV IgM infection according to the Socio-demographic characteristics of the studied children are shown in (Table 2). Males were more likely to have HAV infection than females in 63.6%, while this difference was not statistically significant (p-value = 0.414). However, children aged 7 and 8 years old were more susceptible to have recent infection of HAV in (45.5%) of cases for each, compared to children aged 9 years of age which was (9.0%) for IgM antibody, with a significant association (P-value = 0.022). Moreover, participants with low economic level were more susceptible to have HAV IgM antibody (90.9%). The higher frequency of HAV IgM antibody was noticed in the children who live in random houses. The number of persons (11-15 person) in household were more likely to have HAV IgM antibody which is 13(59.1%) compared with the number of persons (6-10 person) in household 9(40.9%).Regarding the education level of the parents; the highest percent were among children's of parents who just read and write (68.2%), while the lowest percent were among children's of illiterate parents and parents had primary education (4.5%) for each, but there was no significant association (p-value >0.05) as shown in the same table.

Table 2 : Relationship between the Socio-demographic characteristics of the studied children and HAV IgM antibody

Characteristics		IgM N: 422				Total		X^2	p-value
		Positive		Negative					
		No.	%	No.	%	No.	%		
Sex	Male	14	63.6	287	71.8	301	71.3	1.636	0.201
	Female	8	36.4	113	28.2	121	28.7		
Age (years)	7	10	45.5	129	32.2	139	32.9	15.09	0.0001*
	8	10	45.5	132	33.0	142	33.6		
	9	2	9.0	101	25.2	103	24.4		
	10	0	0.0	38	9.5	38	9.0		
House structure	Random	22	100	386	96.5	408	96.7	22	0.0001*
	Apartment	0	0.0	14	3.5	14	3.3		
Socio-economic status(SES)	Moderate	2	9.1	62	15.5	64	15.2	14.72	0.0001*
	Low	20	90.9	338	84.5	358	84.8		
Level education of parents	illiterate	1	4.5	17	4.2	18	4.3	4.545	0.033*
	Read and write	15	68.2	193	48.2	208	49.3		
	Primary	1	4.5	38	9.5	39	9.2		
	Secondary	3	13.6	94	23.5	97	23.0		
	University	2	9.1	58	14.5	60	14.2		
Number of persons in household	≤5	0	0.0	20	5.0	20	4.7	10.696	0.004*
	6-10	9	40.9	182	45.5	191	45.3		
	11-15	13	59.1	198	49.5	211	50.0		

***Significant: p-value ≤0.05 is significant.**

3.4. Risk factors associated with HAV infection:

Some associated risk factors were studied evaluating the emergence of HAV infection including source of drinking water and method of sewages

disposal, they were shown to associate the presence of HAV IgM antibody, although they have not shown a significant association with HAV infection clarified in (Table 3). Another risk factors that were statistically significant with HAV infection including child who close contact with person with HAV infection (77.3%), child who do not practice personal hygiene (hand washing) after outside from bathroom (72.7%), child who have not special towels (68.2%) and child who share clothes with others (63.6%) as shown in the same table.

Table 3 : HAV infection with some risk factors associates the infection

Risk factors		IgM N: 422				Total		X^2	p-value
		Positive		Negative					
		No.	%	No.	%	No.	%		
Source of drinking water?	Tap water	18	81.8	265	66.2	283	67.1	2.288	0.131
	Water treated with cholorine	4	18.2	135	33.8	139	32.9		
Method of sewages disposal	General disposal	21	95.5	357	89.2	378	89.6	0.860	0.355
	Special disposal	1	4.5	43	10.8	44	10.4		
Are you practice personal hygiene after outside from bathroom? (Hand washing)	Yes	6	27.8	42	10.5	48	11.4	5.820	0.016*
	No	16	72.2	358	89.5	374	88.6		
Did you have special towels?	Yes	7	31.8	210	52.5	217	51.4	3.571	0.059*
	No	15	68.2	190	47.5	205	48.6		
Have you share your clothes with others?	Yes	14	63.6	145	36.2	159	37.7	6.661	0.010*
	No	8	36.4	255	63.8	263	62.3		
Is a family member infected with	Yes	17	77.3	360	90.0	377	89.3	11.762	0.002*
	No	5	22.7	21	5.2	26	6.2		

HAV ?	I don't Know	0	0.0	19	4.8	19	4.5	

***Significant : *p-value* < *0.05* is significant**

4. DISCUSSION

This study was similar to a study that performed in Aden by Bawazir et al. 2010, we found that HAV IgM antibody present in about (5.2%), their findings showed that HAV IgG antibody were (86.6%)[15]. In our study there was a significant difference with HAV infection between males and females (63.6% and 36.4% respectively). This study was different with Al Rashed RS working in Saudi Arabian, showed that no significant difference with HAV infection between males and females (51.3%, 53.5% respectively) [16].

The results were concurred to a study that carried out in Nigeria by Aliyu Ibrahim 2015, his findings showed that HAV IgM antibody were 14 (7.8%)[17]. Children aged 7 and 8 years old were more likely to have HAV recent infection which was 10 (45.5%) for each in this study compared with children aged 9 years of age which was 2 (9.0%) for IgM antibody, our findings concurred with a study in Nigeria[17].

There was no significant association between sex and seropositivity to anti-HAV antibody in this study. This was also demonstrated by Gomes et al. working in Brazil, showed no significantly association between sex and HAV infection. This is possibly due to the fact that both sexes live in the same endemic environment and are exposed to the same predictors of the infection[18].

The present study revealed that lower levels of parents education were no significantly association with HAV infection. This study was different with Salama et al. working in Cairo, showed significantly association between lower levels of parents education and HAV infection[19].

In the our study, the majority of low SES children who gave a history of symptomatic HAV infection were under 10 years of age while for children of high SES the majority who gave history of symptomatic infection were aged more than 10 years. Children who got symptomatic infection above age of 10 years reported severe form of symptoms compared to younger children.

Similarly, Arguedas and Fallon reported that the severity of HAV illness increases with age[20].

A higher incidence of IgM antibody was noted with greater family size but it was not statistically significant. However, Fix et al. in Santiago, chile found a significant association between HAV infection and crowded living situations[21].

Also no significant association was showed between HAV infection and 3 public primary schools, although the students in Legislator's primary school are less likely to be infected with hepatitis A virus than Al-nour primary school and Asma bint Abi Baker elementary school, these findings were similar to findings in a study in Nigeria[17].

However, method of faecal waste disposal and source of drinking water were not significantly associated with the HAV infection in this study. Escobedo-Melendez et al. working in Mexico also showed no association between sewage disposal method with HAV infection[22]. Vancelik et al. working in eastern Turkey, showed no significant association between source of drinking water and HAV infection[23].

No previous studies have examined the incidence of HAV IgM in the children in Hodeidah governorate, although no clinical reports of infections have been made. Screening for incidence of HAV IgM antibody is very important because of many risk factors associate the presence of HAV in Hodeidah Governorate, such as the close contact with person with HAV infection and poor sanitary conditions including personal hygiene conditions such as child who do not practice personal hygiene (hand washing) after outside from bathroom, child who have not special towels and child who share clothes with others.

A history of hepatitis or contact with a case of hepatitis has been shown to be associated with anti-HAV seropositivitiy[24]. In the present study , statistically significant association was found. This study was different with Salama et al. working in Cairo, showed no significant association between contact with a case of hepatitis and HAV infection[19]. In the current study, there was a significant relationship between HAV infection and poor sanitary conditions (personal hygiene conditions) (e.g. no have special towels). HAV seropositivity were

higher among children living in poor sanitary conditions and were the most important significant risk factors for the prediction of HAV seropositivity. This is in accordance with studies done in Saudi Arabia and in Santiago[16,21].

5.CONCLUSIONS:

This study concluded low HVA infection among children of primary schools in Al- Hawak district, Hodeidah city , Yemen. The most risk factors of infection with HAV were close contact , poor sanitary conditions , house structure. and crowding in house.

DISCLAIMER

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

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