

Serodetection of Hepatitis A Virus among Food-handlers in Khartoum Locality, Sudan

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Abstract

Background: Hepatitis A virus (HAV) infections occur mainly as a result of bad hygienic conditions and Foodborne infections are very common in developing countries due to the problem of both personal and environmental unhygienic sanitary practices.

Objective: The aim of this study was to detect HAV among food handlers working in cafeterias in Khartoum Locality.

Methods: Enzyme-linked immunosorbent assay (ELISA) was done to determine the presence of anti-HAV IgM and IgG among 90 food handlers (73 males and 17 females) during the period from June to September 2013.

The results: HAV IgM antibodies were detected in 4.4 % (4 /90) and 98.8% (89/90) were positive for anti-HAV IgG antibodies.

Conclusion: This study concluded that, there is asymptomatic individuals indicate that the HAV circulate at low but considerable levels especially among food handlers; that may be a source of outbreak.

Keywords: Anti-HAV IgM and IgG, ELISA, Hepatitis A virus, Food handlers, Sudan

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Introduction

Hepatitis A virus (HAV) leading cause of acute viral hepatitis in the world. In developing countries, infection is associated with poor hygiene ⁽¹⁾. However, infected food handlers remain the source of most reported food borne outbreak, infected food handler who handled uncooked food or food after it had been cooked and during that infectious period were the most common source of food borne outbreaks ⁽²⁾.

Hepatitis A virus (HAV) is a non-enveloped single stranded RNA virus, now considered to be a unique member of the *Picornaviridae* family classified in the genus *Hepatovirus*. The virus replicates in liver cells (hepatocytes). There are seven genotypes of HAV, four of which affect humans with genotypes I and III as the most common, but only one serotype exists. Infection with any of the genotypes usually results in lifelong immunity against all strains of HAV ^(3,4).

The virus transmitted primarily via the faecal-oral route via ingestion of contaminated food or water or through direct contact with an infectious person ⁽⁵⁾.

Hepatitis A virus (HAV) contamination of a food product can occur at any point during cultivation, harvesting, processing and distribution or preparation the source of most reported foodborne hepatitis A outbreaks has been HAV-infected food handlers present at the point of sale or who have prepared food for social events ⁽²⁾.

Proper hygiene and safe food handling practices are essential, because asymptomatic infected food handlers, including those shedding virus during the last 10 to 14 of their incubation periods, can serve as significant source of contamination and subsequent disease propagation through the community ⁽⁶⁾.

Factors to consider in assessing the risk of transmission to patrons include whether the infected food handler handled foods that were not subsequently cooked; whether he or she had diarrhea, which might increase the risk of transmission; and his or her hygienic practices. If food handler with hepatitis A who handles high risk foods (foods that are handled and not subsequently cooked) during the infectious period is judged to have poor hygiene or has diarrhea, the Centers for Disease Control and Prevention (CDC) recommends considering notification of exposed members of the public to offer them immunoglobulin within two weeks of exposure ⁽⁷⁾.

The HAV can be demonstrated by the presence of IgG anti-HAV antibodies in serum. Determination of current or recent infection is achieved by the presence of anti-HAV IgM antibodies in serum, which are evident soon after infection and remain detectable for about 6 months or longer, in some cases⁽³⁾.

Worldwide, the endemicity of HAV infection varies according to regional hygienic standards with the highest prevalence of infection occurring in regions with the lowest socioeconomic levels⁽⁸⁾. Although the incidence of hepatitis A has declined over the past decade primarily because of hepatitis A immunization^(9,10), the infection is still being frequently reported.

Tens of millions of individuals worldwide have been reported to be infected with HAV each year. In Sudan during the floods of 1988 in Khartoum patients with acute hepatitis reported low incidence of HAV infection at (5.45%). Also another prevalence rates 33.3%^(11,12,13) was reported among pediatric population with acute hepatitis in Khartoum state, in related studies, reported prevalence rates 5.3% and 2.3% in Burkina Faso and Mexico, respectively. Who reported the level of HAV IgM^(14, 15).

Though there are few indicative studies have been taken in Sudan about the prevalence of hepatitis A virus infection and susceptibility. There is no doubt food borne illnesses resulted from improper food handling – therefore; this study was conducted to identify seroprevalence infected food handler workers in cafeterias who infected with hepatitis A virus in Khartoum locality.

Materials and methods

The current descriptive, cross-sectional study carried out between June to September 2013. 90 food handler working in Sudan University of Science and Technology cafeterias were included in this study, Sudan were recruited in this study. This study was approved by Sudan University of Science and Technology ethical committee board and an informed consent was obtained from each patient before collecting the demographic and clinical data. Five-mL blood samples were obtained by venipuncture for serological analyses. Samples were centrifuged and sera were separated immediately. Sera were stored at -20°C , and tested

for the presence of anti-HAV IgM and IgG antibody by enzyme-linked immunosorbent assay (ELISA) (PRECHEK IgM/ IgG anti-HAV; Prechek Bio, Inc., USA). The presence of anti-HAV IgM antibody was considered as the evidence for recent infection and presence of anti-HAV IgG was considered as prior exposure to HAV. All collected data were analyzed using SPSS. Descriptive statistics were reported as the mean \pm SD for continuous variables and as the frequency (%) for dichotomous variables. To evaluate the relationship between different factors we performed chi-square analysis. Quantitative variables were compared using independent t-test. P. values < 0.05 were considered statistically significant.

Results

Socio-demographic characteristics

A total of ninety food-handlers, (73(81%) of males and 17(19%) females) were included in this study (Table 2). Their ages range from 17 to 55 years; 25(28 %) there were had less than 20 years old, 37(41%), 21 to 30 years old and 28 (31%) above 31 years old (Table 2).

In hand washing practices, 83(92%) food handlers had a habit of hand washing after toilet while 7(8%) of food handlers had no habit of hand washing after toilet. While 53 (59%) of food handlers had the habit of hand washing with soap and water, the rest 37(41%) did not use soap for their hand after toilet. Almost half of food handlers 50(56%) had no medical check-up previously. Only 2(2%) the 90 of food handlers were certified for training in food handling and preparation (Table1).

Seroprevalence of anti-HAV immunoglobulin

The results of detection anti- HAV among food handlers demonstrates that 4(4%) subject had anti-HAV IgM positive 2(2.7%) from males and 2(11.7%) from females, while 86 (96%) were shown anti-HAV IgM negative 71(97.2%) from males and 15(88.2%) from females, while reveal that 89(99%) subject have anti-HAV IgG positive 73(81%) from males and 16(94.1%) from females, while 1(1%) from females were shown anti-HAV IgG negative only.

Table 1 Hygienic practice of food handlers working at Sudan University of Science and Technology cafeterias

Variables	No.	%
Certified in food preparation and handling		
Yes	2	2
No	88	98
Medical checkup		
Yes	40	44
No	50	56
Hand washing after using toilet by water		
Yes	83	92
No	7	8
Hand washing after using toilet with soap and water		
Yes	53	59
No	37	41
Hand washing before preparing food		
Yes	90	100
No	0	0
Total	90	100

Table 2 Socio-demographic and Clinical data

characteristic	No.	%
Study Group	90	100
- Male	73	81
- Female	17	19
Distribution of food handlers according to age group		
-Less than 20 years old	25	28
- 21 to 30	37	41
-Above 31 years old	28	31
Detection anti- HAV IgM antibodies in food handlers		
-Positive	4	4
- Negative	86	96
Detection anti- HAV IgG in food handlers		
- Positive	89	99
- Negative	1	1

Discussion

Hepatitis A virus (HAV) is an important pathogen which has been responsible for many food-borne outbreaks. HAV-excreting food handlers, especially those with poor hygienic practices, can contaminate the foods which they handle. Consumption of such foods without further processing has been known to result in cases of infectious hepatitis.

This study investigating HAV among food handlers in Khartoum Province. Ninety food handlers (n=90) were selected randomly for the present study. 73(81.1%) of them were males, and 17(18.9%) were females, with mean age of 27. The study detected HAV IgM antibody 4(4.4%) positive, while HAV IgG 89(98.8%) had positive, the seroprevalence of anti-HAV IgM indicates that the incidence of infections is relatively high and that there is a risk of major outbreaks if vaccination is not continued. The results were similar to those obtained by in Sudan, in Burkina Faso whom reported the level of HAV IgM as 5.4%, 5.3% and 2.3%, respectively^(13,14,15). The difference between these two groups could be due by the close proximity of these women to children who are considered to be potential carriers of the virus⁽¹⁶⁾. Also higher rates were reported in United States, in Rio de Janeiro and in Iran, their results consist with present finding (11.0%, 10.5% and 8.3%, respectively) using ELISA to detect HAV^(17,18,19). The seropositivity rate of anti-HAV revealed by the present study was similar to those reported result consist with present finding (83% in children under 10 years and 95% in (10-24 years), 72.7% (15-30 year) and 85.9%, respectively)^(20,21,22), and rate of seropositivity of anti-HAV associated to high prevalence was among the group of non-educated rather than educated parents in Kuwait⁽²³⁾. The proportions of anti-HAV seropositive in the different age groups of food handler revealed a high prevalence (>50%) in the group 25-35 year olds. The different rates of seropositivity between the different age groups suggest age-related HAV exposure in Sudan, a phenomenon probably associated with the severity of the disease increasing with age. In the United States, the hospitalization rates for hepatitis A infections are 3% for individuals younger than 18 years and 13% for individuals older than 18 years. The fatality rate is 0.3% overall, but it is higher than 2% for individuals over 40 years old⁽⁷⁾. The seroprevalence we observed in the 26-35 year old group (18.7%) agreed with the findings^(24,25). Studies in other emerging or developing countries around the world have shown that the prevalence of HAV infection decreases as the living conditions of the populations improve⁽²⁶⁾. Hands come in direct contact with the mouth mainly from hand surfaces especially under the fingernails

which are reservoir of microorganisms ⁽²⁷⁾. Entry of microorganisms can be controlled by proper hand washing which reduces the rate of waterborne and food borne diseases ⁽²⁸⁾. Studies have shown drastic decreases in the microbial counts due to surface asepsis in the process of hand washing with soap ⁽²⁹⁾. It was also reported that frequent hand washing represented an important element of hygiene that may interrupt transmission of organisms ⁽³⁰⁾. A strong causal relationship between hand hygiene and gastrointestinal disease risk has also been demonstrated by several studies which indicated that hand hygiene combined with education can bring about a major reduction in most gastrointestinal illness ⁽³⁰⁾. Hence, effective hand washing (including drying) remains the most effective and least expensive major to prevent transmission of infection.

Toilet facilities are important tools integrated in gastrointestinal health in general populations. When not cleaned in a routine and periodic manner, it can serve as a major source of microbial transmission and act as a hidden source for infections ^(31, 32). Many people may be uninformed about the risk of spreading of microbes when using the toilet and the subsequent surface contamination that may extend infection via simple contacts in both sexes. Some viruses could persist in the air even after toilet flushing and infection may be acquired after inhalation and swallowing and as such, the presence of more microbes in pit toilets compared with sitting toilets would also lead to a higher rate of contact of the infectious agent. Also the absences of individual hygiene by the large number of people who use these facilities result in easier transmission of microbes to susceptible individuals. In relation to the transmission of infection studies by Mahdarvinejad *et al.*, (2011) have also shown that in water closet system, large numbers of bacteria and viruses when seeded into household toilets may remain in the bowl even after flushing and even continual flushing could not remove a persistent fraction. This was found to be due to the adsorption of the organisms to the porcelain surfaces of the bowl, with gradual elution occurring after each flush. Hence, there is also a possibility that a subject may become infected from an aerosol created in a toilet ^(35,36). Further treatment either by boiling has been recommended as most bacterial and viral pathogens e.g. HAV virus are also rapidly inactivated at temperatures above 60-85°C or higher temperatures (85°C /185°F) for one minute. Boiling of water is a widespread practice despite the additional costs in both fuel and time. Several studies have shown that low socioeconomic status, poor

hygiene, lack of sewers, and underdeveloped health care facilities constitute the main transmission risk factors for HAV⁽¹⁴⁾.

Conclusion

The findings for asymptomatic individuals indicate that the HAV circulate at low but significant levels especially among food handler, may be source of outbreak, when working in cafeteria with no good hygiene and no reported diarrhea who prepared many cook and uncooked foods served. Assessing hygiene and symptoms is subjective, and may be difficult to accomplish. The effectiveness of the recommended criteria for determining when IG should be provided to exposed members of the public needs to be evaluated.

Finally, addressing the public health problems associated with the enteric transmission of viral hepatitis in developing countries will require implementing stronger measures to prevent fecal contamination of food and water.

Recommendations

- 1-HAV-positive food handlers should also be confirmed by PCR, Sequencing and phylogenetic analysis done to characterize the HAV strain in Sudan.
- 2-larger sample size is needed to accurately determine the prevalence rate of HAV among all Sudanese people and especially in food handlers.
- 3-food handler must have license to work and health education, training practices such as hand washing and glove use are essential steps towards ensuring food safety.
- 4- Periodic medical examination along for food handler necessary should be done.
- 5-food handler infected with Hepatitis A should be excluded from food handling duties for seven days after the onset of jaundice and/or symptoms
- 6- Food handler should be considered for prophylaxis (HNIG or HAV vaccine).

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