



Viewpoint

Waterborne & foodborne viral hepatitis: A public health perspective

Viral hepatitis is a hepatic disorder of public health importance, and it can be waterborne/foodborne or bloodborne¹. Waterborne or foodborne hepatitis caused by hepatitis A virus (HAV) and hepatitis E virus (HEV), has faeco-oral route of transmission². The World Health Organization (WHO) report reveals that viral hepatitis presently ranks as the 7th leading cause of mortality worldwide². Normally, both HAV and HEV may cause outbreaks or present in epidemic form, and the disease is usually self-limiting².

Understanding the epidemiology and biological determinants of hepatitis A and E is very important. HAV belongs to the family *Picornaviridae* and genus *Hepatovirus*. Based on their genetic diversities, HAVs are divided into six lineage or genotypes; of those, genotypes 1, 2 and 3 infect human beings. HEV genotype 1 affects mainly young adults including women of reproductive age. Unique characteristics of HEV genotype 1 cause high mortality among pregnant women¹. Studies across the globe have revealed that HEV genotype 1 is endemic in Asia and Africa, and HEV genotype 3 is the main cause of disease in the developed countries^{1,3}. In India, HAV genotypes 1 and 3 and HEV genotype 1 are the predominant strains. An upward shift in the average age for contracting first HAV infection has been observed among the socioeconomically developed Indian population resulting in pockets of susceptible population^{1,3}, low seroprevalence has been reported until the age of 15 yr, reaching to 40 per cent in young adults³. HEV is more common among the children in India. It is a major public health threat during pregnancy causing acute liver failure⁴. Mortality in general population ranges from 0.1 to 4 per cent, while among women in the third trimester of pregnancy, it can reach up to 25 per cent⁵. HEV may be responsible for 10-40 per cent of acute hepatitis and 15-45 per cent of liver failure in India⁶. Seroprevalence of HAV and HEV has been studied across the globe, and socio-economic status, age and

source of drinking water have been found to be the major determinants for seroprevalence of HAV and HEV⁷.

Average incubation period of HAV is 30 days with a range being 15-50 days¹. Clinical presentation of HAV infection may be asymptomatic (anicteric) or icteric¹. The common presentation of HAV infection is jaundice and reduction in appetite. Anicteric clinical presentation with increased level of aminotransferase may occur. Other associated symptoms of HAV infection are anorexia, malaise, fatigue, fever, myalgia, arthralgia, headache, abdominal pain, *etc.* Infection due to HAV usually recovers on its own, but there may be relapse of the symptoms after 12-18 months. HAV-related infections may become fulminant if not managed properly. The risk factors associated with occurrence of fulminant HAV hepatitis are alcoholism, malnutrition, chronic liver disease and prolonged use of acetaminophen^{1,8}.

Incubation period following exposure to HEV ranges from 2 to 10 wk with an average of 5-6 wk⁴. The infected persons are believed to shed the virus beginning a few days before to around 3-4 wk after the onset of the disease. In areas with disease endemicity, symptomatic infection is common in young adults aged between 15 and 40 yr^{4,9}. Pregnant women with HEV particularly those in the second and third trimester are at the risk of acute liver failure and foetal loss¹⁰. Chronic HEV infection is not common, but it can occur in immunosuppressed people particularly organ transplant recipients on immunosuppressive drugs with genotypes 3 and 4⁴.

HEV is unique because it has several susceptible animal species capable of functioning as a reservoir of the disease (swine, wild boar and deer). Zoonotic transmission caused by genotypes 3 and 4 has been seen^{11,12}. Zoonotic transmission through direct contacts with infected animals has also been reported. Farmers,

veterinarians and workers attending animals often comprise the at-risk group for HEV infection¹³⁻¹⁵.

Vertical transmission of HEV has also been demonstrated via intrauterine and perinatal routes¹⁶⁻¹⁹. The clinical course in vertically transmitted hepatitis E survivor neonates is self-limiting¹⁷. Comparative molecular analysis of HEV sequences from blood donors and recipients has been performed, and direct evidence of parenteral transmission (HEV genotypes 1 and 3) has been reported^{20,21}.

The most reported source of foodborne hepatitis A outbreaks has been HAV-infected food handlers present at the point of sale (such as in a restaurant) or who prepare food for social events (such as a wedding). A single HAV-infected food handler can transmit HAV to dozens or even hundreds of persons and cause a substantial economic burden to public health^{22,23}. Hepatitis A outbreaks have also been found to be associated with consumption of freshly produced vegetables and fruits contaminated with HAV during cultivation, harvesting, processing or distribution²⁴.

Definitive diagnosis of HEV is based on the detection of the specific IgM antibody to the virus in the patient's blood, and this is usually adequate in areas where the disease is endemic²⁴. Additional test includes reverse transcription polymerase chain reaction (RT-PCR) to detect the HEV RNA in clinical samples like blood/stool. This assay requires specialized laboratory facilities and is particularly needed in the areas where HEV is infrequent or for the cases with chronic HEV infection^{4,9}. Several diagnostic flow charts have been proposed, but the standardization of diagnostic criteria still remains critical²⁵. Diagnosis of HEV infection in immunocompromised patients and solid organ transplant recipients in whom seroconversion to anti-HEV antibodies is delayed or may not occur at all, is often challenging.

The treatment of HEV in normal course is supportive as the disease is self-limiting. Hospitalization is required for patients presented with fulminant hepatitis and symptomatic pregnant women. Immunosuppressed people with chronic HEV infection benefit from specific treatment with ribavirin, and in some specific situation, interferon has been successfully used⁴.

Whether HAV and HEV vaccines are to be introduced in the Universal Immunization Programme is an important area of research to be addressed²⁶. Mixing of contaminated sewage water with drinking

water sources during natural disasters imposes a major public health threat. During such natural disasters, ingestion of contaminated water (by sewage/or inadequately treated) is an important source of infection of HAV and HEV²⁶. The largest risk of foodborne HEV is introduction through food into regions where population herd immunity is relatively limited. Epidemiological studies have provided evidence for consumption of undercooked or raw meat as risk factor for acquisition of HEV infection^{4,27,28}.

In China, studies have revealed that the seroprevalence of HEV is generally low among children, and it increases with age. In males, the increase with age was most marked in 15-29 yr olds, and in females, this occurred in 20-39 yr olds²⁹. Individuals living in the southern part of China had higher regional seroprevalence estimates than in those living in North China²⁹. Among the different economic development areas, individuals living in Western China had the highest regional seroprevalence estimates²⁹. Individuals in the age group of 15-60 yr and those living in Western China showed significantly higher odds of HEV seropositivity²⁹ compared to other parts of China²⁹. A study conducted in rural Bangladesh found that the seroprevalence of hepatitis E was 22.5 per cent³⁰. The seroprevalence of hepatitis E among urban and rural populations in Vellore, India was found to be 14.48 per cent³¹. In a multicentric study among healthy volunteers (the army recruits), the seroprevalence of hepatitis E was found to be 17.05 per cent and that of hepatitis A was 92.68 per cent³².

The mortality due to communicable disease has declined globally, but absolute burden and relative ranking of viral hepatitis as a cause of mortality has increased from 1990 to 2013². Thus, the plan of the Government of India was to eliminate viral hepatitis as a major public health threat in the region by the year 2030³³. This plan includes elimination of both bloodborne and waterborne forms of viral hepatitis. The WHO has asked each of the Member States to prepare a National Action Plan to combat against viral hepatitis³³.

The National Viral Hepatitis Control Programme was launched by the Government of India in July 2018³³. Lack of awareness among public healthcare providers, asymptomatic infection during early stages and lack of proper diagnostic facilities at all levels are the major challenges for control of viral hepatitis

in India. The prevention of mortality for waterborne viral hepatitis includes prevention of new infections, management of viral hepatitis including diagnosis and treatment programme, capacity building at various levels and effective surveillance system³³.

Vaccines are available both for HAV and HEV. Hepatitis A vaccine is used in India. Hepatitis E vaccine was licensed in China in 2011³³. WHO's Strategic Advisory Group of Experts on Immunization reviewed the existing evidence on the safety, immunogenicity, efficacy and cost-effectiveness of the licensed hepatitis E vaccine^{2,33}. In India, this issue is under scrutiny and review of National Action Plan for Viral Hepatitis^{2,4,33}.

The *Swachh Bharat* Mission campaign in India has taken initiatives in maintaining cleanliness and hygiene, setting up of toilets so that open field defecation could be avoided³⁴. Awareness generation in different areas of hygiene and sanitation at all levels is carried out under this programme^{34,35}. The National Rural Drinking Water Programme (NRDWP) which ensures safe and potable drinking water for all is also crucial in this regard³⁴. Proper implementation of NRDWP and *Swachh Bharat* Mission will help in this regard. Economic evaluation studies of implementation of hepatitis A and hepatitis E vaccines in National Immunization Schedule should be carried out. Proper regulations for food safety are also required. Ensuring safe food practices everywhere including the street food and hawkers in trains and buses is also important. Role of Municipal Corporations and *Gram Panchayat* is crucial in this regard. Specific awareness campaign on hepatitis E in pregnancy is to be done. All mother and child care units personnel should be given training on diagnosis and management of hepatitis during pregnancy with special focus on hepatitis E. The research in this area needs to be prioritized for the benefit of general population.

Conflicts of Interest: None.

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