Hepatitis A Virus Infection: Epidemiology, Diagnosis, and Prevention in the 21st Century

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Abstract

Hepatitis A virus infection (HAV) is an acute infectious disease caused by the hepatitis A virus (HAV). It is primarily transmitted via the fecal-oral route, and the clinical course depends on the patient's age and comorbidities. Treatment is symptomatic, while the most effective form of prevention remains vaccination. This article presents the current knowledge on the epidemiology, clinical course, treatment, and prevention of hepatitis A.

Background:
Hepatitis A virus (HAV) is an acute infectious disease of the liver transmitted primarily via the fecal-oral route. Despite the availability of effective vaccines, HAV remains a significant public health concern in both low-and high-income countries.

Objectives: This article aims to provide an updated review of HAV infection, including its etiology, transmission routes, clinical manifestations, diagnostic methods, treatment strategies, preventive measures, and implications for public health.

Methods:
The article presents a comprehensive synthesis of current literature, epidemiological reports from Poland and Europe, and WHO/ECDC guidelines, with a focus on diagnostic criteria, disease burden, and vaccination strategies.

Results
HAV infection typically follows a self-limiting course but may lead to serious complications, especially in older adults or individuals with preexisting liver disease. Diagnosis relies on anti-HAV IgM detection, supported by biochemical and, when needed, molecular tests. Treatment

is supportive, as no antiviral therapy exists. Prevention through vaccination is highly effective and recommended for high-risk populations.

Conclusion

HAV remains a globally relevant infectious disease. Surveillance, public health interventions, and universal or targeted vaccination are key to limiting its spread and impact. Improving sanitation and access to immunization in at-risk groups is critical to long-term control.

Keywords:

Hepatitis A, HAV, acute viral hepatitis, acute liver infection, fecal-oral transmission, public health, epidemiology.

1. Introduction

Hepatitis A is an acute infectious liver disease caused by the hepatitis A virus (HAV). Transmission occurs predominantly via the fecal-oral route, typically through the ingestion of contaminated food or water, as well as through direct contact with infected individuals [1]. Despite the availability of effective vaccines, hepatitis A remains a significant public health concern, particularly in regions with medium to low sanitary standards.

2. Etiology and Pathogenesis

HAV is transmitted almost exclusively by the fecal-oral route. Infection typically results from the ingestion of food or water contaminated with the feces of an infected person, or through direct contact with an infected individual. HAV is highly stable in the environment. It can survive for weeks in water, soil and on surfaces while retaining its infectivity. The virus is highly contagious; the minimal infectious dose is as low as several hundred viral particles, which facilitates outbreaks, especially in areas with poor hygiene and inadequate sanitation [2].

Common sources of infection include consumption of contaminated food, particularly unpasteurized products, shellfish harvested from polluted waters, and vegetables or fruits washed with contaminated water. In countries with low sanitation levels, HAV circulates endemically, and children often contract the infection asymptomatically at a young age, acquiring lifelong immunity. In contrast, in developed countries, most cases are sporadic or occur in outbreaks related to international travel or closed-community settings [3,4].

Transmission may also occur through close contact with an infected person, particularly during the incubation period, which usually lasts 15-50 days (on average 28–30 days). Infected individuals excrete the virus in their stool 2-3 weeks before the onset of clinical symptoms. For this reason, household transmission and spread in daycare centers, long-term care facilities, and nursing homes are common.

Risk groups include children, daycare workers, food service employees, and professionals exposed to feces due to occupational reasons (e.g., healthcare workers, sewage treatment employees) [5]. In recent years, sexual transmission has gained increasing importance, particularly among men who have sex with men (MSM). HAV outbreaks in this population have been documented in multiple European countries, including Poland, with transmission occurring primarily via oral-anal contact or other practices involving exposure to fecal matter. As a result, vaccination is strongly recommended in this population, particularly for those engaging in high-risk sexual behavior or traveling to endemic regions [6,7].

Other transmission routes, such as via blood transfusion, are extremely rare, typically occurring during the pre-symptomatic viremic phase before the appearance of IgM antibodies. Vertical transmission from mother to fetus has not been shown to be clinically significant, and healthcare-associated infections are generally linked to lapses in infection control and hygiene practices [8].

These transmission pathways underscore that HAV remains a major public health concern, especially in settings with poor sanitation, high population mobility, and among high-risk groups.

3. Epidemiology

Hepatitis A is an infectious disease with a global distribution, and its prevalence primarily depends on hygiene conditions, access to clean water, and overall sanitation standards. According to the World Health Organization (WHO), approximately 1.4 million new cases of hepatitis A occur each year, although the actual number is likely much higher due to the asymptomatic nature of many infections [9].

Over recent decades, Western Europe has seen a decline in the overall endemicity of hepatitis A, largely due to improved sanitation. At the same time, the number of susceptible adults has increased, contributing to a higher risk of outbreaks, particularly in vulnerable populations [10].

Between 2016 and 2018, Europe experienced a large-scale outbreak involving over 15,000 confirmed cases, primarily among MSM, people who use drugs, and individuals experiencing homelessness [11].

The European Centre for Disease Prevention and Control (ECDC) emphasizes the seasonality of infections, with the highest incidence reported during summer and autumn. Infections are also increasingly reported among travelers to endemic regions and during local foodborne outbreaks, such as the consumption of raw shellfish [12].

According to the ECDC's 2022 report, the highest incidence rates were recorded in Romania, Bulgaria, and Lithuania-exceeding 10 cases per 100,000 population. The average incidence rate in the European Union was approximately 3.2 per 100,000 [13].

In Poland, hepatitis A was historically a sporadic disease, with only a few dozen cases reported annually. However, the epidemiological situation changed dramatically in 2017, when reported cases surged from 35 in 2016 to 3,015 in 2017, associated with Poland's involvement in the broader European HAV outbreak [14].

According to the National Institute of Public Health-National Institute of Hygiene (NIPH-NIH), 421 cases of hepatitis A were reported in Poland in 2023, an increase from 287 cases in 2022. The highest case numbers were recorded in the Mazowieckie, Dolnośląskie, and Śląskie provinces [15].

Particular attention is drawn to age distribution: the majority of recent cases occurred in adults over the age of 25, among whom the disease usually follows a more severe clinical course. Infections in children remain rare and are often asymptomatic or mild [14].

Experts highlight the insufficient immunization coverage in the general population and the absence of hepatitis A vaccination from the national routine immunization schedule (except for specific high-risk groups such as healthcare workers, travelers, and individuals with chronic liver disease). These factors contribute to the continued risk of viral spread in the event of exposure [16].

4. Clinical Manifestations

The clinical presentation of HAV infection varies significantly depending on the patient’s age and immunological status. In children under 6 years of age, more than 70% of infections are

asymptomatic or mildly symptomatic, whereas in adults, clinical symptoms occur in over 70% of cases and tend to be more severe [5,8]. The incubation period averages 28-30 days (range: 15-50 days), and viremia begins approximately two weeks before symptom onset, persisting up to one week after resolution of symptoms [17].

The prodromal phase, typically lasting 3 to 10 days, is characterized by nonspecific symptoms such as fatigue, fever, nausea, vomiting, myalgia and arthralgia, abdominal pain, and loss of appetite. This is followed by the icteric phase, during which patients develop jaundice (particularly noticeable in the sclerae), dark urine, pale stools, pruritus, and hepatomegaly [18,19]. The disease usually resolves within 2-3 weeks, although convalescence may extend for several months. A relapsing course occurs in approximately 10-20% of adult patients but does not lead to chronic infection [20].

In older adults, individuals with chronic liver disease, or immunosuppressed patients, HAV infection may follow a more severe course and carries a risk of acute liver failure. Mortality in these groups can reach up to 1.5% [5,20].

5. Diagnosis

The diagnosis of HAV is based primarily on serological testing. The presence of anti-HAV IgM antibodies confirms an acute infection. These antibodies become detectable during the prodromal phase and typically persist for 3-6 months [21]. The presence of anti-HAV IgG antibodies indicates past infection or vaccine-induced immunity. Enzyme immunoassays (EIA) used for serological testing demonstrate high sensitivity and specificity (>95%) [22].

In selected cases requiring more detailed assessment such as immunosuppressed patients, atypical clinical presentations, or epidemiological investigations- molecular techniques like reverse transcription polymerase chain reaction (RT-PCR) may be employed to detect HAV RNA in serum or stool. These are primarily used for research and public health surveillance purposes [21].

Biochemical evaluation typically reveals markedly elevated serum aminotransferases (ALT, AST often >1000 IU/L), elevated total bilirubin, and possibly raised cholestatic markers (ALP, GGT). In more severe cases, coagulation abnormalities such as prolonged PT or increased INR may also be observed [24].

The differential diagnosis should include other causes of acute viral hepatitis (HBV, HCV, HEV), Epstein-Barr virus (EBV), cytomegalovirus (CMV), hepatotoxic medications, and autoimmune hepatitis (AIH). Imaging studies such as abdominal ultrasonography (US) may be indicated to exclude alternative causes of hepatomegaly or abdominal pain [27].

6. Treatment

Treatment of hepatitis A is exclusively supportive, as the infection is self-limiting and does not lead to chronic hepatitis. No specific antiviral agents against HAV are currently available. Management focuses on symptom relief and supporting hepatic regeneration [19,20].

Core recommendations include rest, a light diet, and avoidance of hepatotoxic substances-especially alcohol and medications metabolized by the liver. During the acute phase, patients are advised to limit physical activity, particularly if systemic symptoms or significantly elevated aminotransferases are present [20,29].

Hospitalization is rarely required but may be indicated in patients with severe clinical presentations, dehydration, persistent vomiting, neurological impairment, or pre-existing liver disease due to the risk of progression to acute liver failure [20,21].

Children and young adults generally experience mild courses of illness, which may be managed at home with regular clinical monitoring. In contrast, older adults or individuals with underlying liver disease may require inpatient care, including monitoring of liver enzymes, coagulation parameters, and metabolic status [21,22].

In some cases, hepatoprotective agents such as ornithine, silymarin, or ursodeoxycholic acid are used; however, their efficacy in HAV treatment has not been confirmed in controlled trials [6]. Experimental treatments including immunomodulators or investigational antivirals have been reported but are not currently part of clinical guidelines [25,27].

Special consideration should be given to patients with cholestatic forms of hepatitis A, characterized by prolonged jaundice and pruritus. Symptomatic treatment-e.g., with cholestyramine-may be used. Corticosteroids are reserved for selected cases and remain controversial [29].

In cases of acute liver failure-particularly with hepatic encephalopathy, INR >1.5, or total bilirubin >20 mg/dL-urgent referral for liver transplantation should be considered [30].

In summary, management of HAV focuses on supportive care and prevention of complications. Early diagnosis, assessment of disease severity, and tailored clinical support-especially in high-risk groups-are essential. Given the lack of specific therapy, vaccination and improved public health measures remain the cornerstone of hepatitis A prevention [17,22].

7. Prevention

Prevention of hepatitis A relies on two key pillars: improvements in sanitation and hygiene, and the use of effective vaccination. Because HAV spreads primarily via the fecal-oral route, access to clean drinking water, adequate sanitation infrastructure, and health education-particularly regarding hand hygiene-are essential to reducing transmission [31].

Vaccination against HAV remains the most effective preventive tool, especially in countries with low or intermediate endemicity where declining childhood exposure has shifted the disease burden to adulthood, when clinical manifestations tend to be more severe [9]. The available vaccines contain inactivated HAV and are highly immunogenic, safe, and well-tolerated. Two doses administered 6-12 months apart provide long-lasting immunity in over 95% of recipients, with protection lasting up to 20 years [32].

Vaccination is recommended for high-risk groups, including: international travelers to endemic regions, preschool and school-aged children, individuals with chronic liver disease, MSM, people who use drugs, and professionals working in healthcare, food service, and mass catering [18,32].

Post-exposure prophylaxis-using either HAV vaccine or immunoglobulin-may be administered depending on the patient’s age and immune status. Indications include household contacts of confirmed cases or outbreak scenarios in kindergartens, schools, and camps [33].

Mass immunization programs have substantially reduced the incidence of hepatitis A and effectively curtailed outbreaks. In the United States, the introduction of a universal HAV vaccination program in the 1990s led to a >90% decrease in hepatitis A cases [34].

To summarize, effective prevention of HAV requires integrated strategies that combine improved hygiene and sanitation with targeted immunization in at-risk populations. From a public health perspective, hepatitis A vaccination remains the most effective method to prevent transmission and severe disease.

8. Public Health Implications

Hepatitis A remains a significant public health issue, particularly in low-resource settings with inadequate hygiene and sanitation infrastructure. As one of the most common foodborne infections, HAV can cause localized outbreaks that burden healthcare systems and disrupt institutional operations such as schools, the military, and long-term care facilities [9,21].

Due to the lack of specific treatment, public health strategies focus on primary prevention. Vaccination is the most effective measure to prevent HAV infection and should be implemented in high-risk populations and outbreak-prone environments [35]. Introduction of routine or recommended vaccination for children has significantly reduced HAV incidence and nearly eliminated outbreaks in many countries [36].

Public health measures also include health education and rapid epidemiological response to outbreaks. Timely identification of the infection source, contact tracing, and emergency vaccination can prevent further spread [37]. HAV also has notable economic implications-not only due to direct medical costs, but also due to productivity losses and the expenses of public health interventions [49]. Thus, improving sanitation and expanding vaccination programs represent cost-effective investments in health systems.

Even in high-income countries, hepatitis A continues to pose a threat. Although the overall incidence has declined, periodic outbreaks persist-particularly among MSM, drug users, and migrants living in overcrowded conditions with poor hygiene [24]. In such settings, timely epidemiological interventions, post-exposure prophylaxis, and public health education are essential.

On a global scale, the WHO advocates for reducing hepatitis A incidence by integrating HAV vaccination into childhood immunization schedules in regions with intermediate endemicity. This aligns with the Sustainable Development Goals for eliminating infectious diseases as a threat to public health [39]. Countries in Latin America and East Asia have nearly eliminated new HAV cases following the implementation of mass immunization campaigns [40].

In conclusion, hepatitis A remains a multifaceted public health challenge. Effective control requires coordinated efforts in vaccination, water and sanitation infrastructure, epidemiological surveillance, and health education-tailored to local risk contexts and vulnerable populations with limited access to healthcare.

9. Conclusion

Hepatitis A virus infection remains a significant yet preventable public health concern worldwide. Although the disease is self-limiting in most cases, it may cause serious complications, particularly in adults and individuals with pre-existing liver conditions. Accurate diagnosis based on serological testing and supportive management are essential for favorable outcomes. However, the cornerstone of hepatitis A control lies in effective prevention strategies-most notably, through vaccination and improvements in hygiene and sanitation.

The shifting epidemiology of HAV, with increasing susceptibility in adult populations due to reduced childhood exposure, underscores the importance of targeted immunization programs, especially in non-endemic regions. Moreover, the occurrence of recent outbreaks in Europe, including among vulnerable groups such as MSM and travelers, highlights the ongoing need for public health surveillance and educational campaigns.

Continued efforts to expand access to vaccination, raise awareness of transmission routes, and strengthen outbreak response mechanisms are critical to achieving long-term control of hepatitis A. Integrating HAV immunization into national immunization schedules, particularly in regions with intermediate endemicity, may provide sustainable protection and reduce the burden of disease globally.

Disclosure

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