



Epidemiology of Viral Hepatitis

Professor Dr Abubakir M. Saleh

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Outline

- Introduction
- Hepatitis A
- Hepatitis E
- Hepatitis B
- Hepatitis C
- Hepatitis D
- Hepatitis G



Introduction

- Six main types hepatitis virus have been identified: A-B-C-D-E-G.
- Majority of infections are asymptomatic.
- Common clinical features include:

Anorexia, nausea, vomiting, right upper quadrant pain.

- Jaundice is the hallmark of infection.



Hepatitis A(HAV)

- Caused by a picornavirus.
- Incubation period:
3-5 weeks (mean 28 days).
- Asymptomatic infection are very common.
- There is no chronic form of disease (there is no carrier state).
- Complications: Fulminant hepatitis is rare(0.1%).



Epidemiology of HAV

- World-wide distribution.
- Endemic in most countries.
- An estimated 1.4 million cases of HAV infections occur each year.
- Infection with HAV occurs predominantly in areas of lower socio-economic status and reduced hygienic standards, especially in developing, and tropical countries.



Transmission of HAV

- Large numbers of virus particle are excreted in stools, before the onset of symptoms.
- Case to case, via faeco-oral route.
- Contamination of food or water with sewage.
- Infected food handlers
- Polluted water.



Diagnosis

- In acute HAV infection: detection of anti-HAV IgM antibodies or HAV RNA.
- HAV IgG antibodies can indicate acute or previous HAV infection.
- HAV IgM and IgG antibodies also become positive early after vaccination, with IgG antibodies persisting for at least two to three decades after vaccination.
- Elevated Liver enzymes (ALT and AST) and serum bilirubin.



Control

- Control depends on high standards of personal and environmental hygiene, for example proper sewage disposal, safe drinking water.
- If patients are in hospital they should, if possible, be barrier nursed as for any feces-carried infection.
- Food handlers should not resume work until 3 weeks after recovery.



Control(Cont.)

Immunization

- Inactivated HAV vaccine is available.
2 doses of vaccine; Second dose 6–18 months after first.
- The vaccine induces antibodies in over 90% of individuals within 2 weeks and protects against infection.
- Hepatitis A vaccines are all highly immunogenic, nearly 100% of adults will develop protective levels of antibody within one month after a single dose of vaccine.



Control(Cont.)

HIG (Passive immunization):

- It is useful in protecting family contacts during epidemics (0.2 ml/ kg intramuscularly). For those going to the tropics a 0.2-0.5 ml/kg gives passive protection for about 6 months.
- HIG; even when it does not prevent infection it does modify the severity of the disease
- Recovery from a clinical attack creates a lasting active immunity.



Hepatitis E

- Recently identified non-A, non-B hepatitis
- Caused by calici virus.
- Incubation period: 30-40 days
- Acute, self-limiting hepatitis, no chronic carrier state.
- Complication: Fulminant hepatitis in pregnant women. (Mortality rate up to 40%).



Epidemiology of hepatitis E

- Hepatitis E is found worldwide, but the prevalence is highest in East and South Asia.
- The incidence is low in first world countries.
- Large outbreaks have described in India.
- Case to case transmission to household contacts uncommon.
- The main source of infection is contaminated drinking water.
- The peak age specific sero-prevalence in endemic countries is in the over-16 years group.



Epidemiology(Cont.)

- In recent years, some of these outbreaks have occurred in areas of conflict and humanitarian emergencies, such as war zones, and in camps for refugees or internally displaced populations (IDP).
- An estimated 20 million infections and 3.3 million acute cases occur annually worldwide with an estimated 56 600 deaths.



Diagnosis

- No routine laboratory tests are available yet.
- Calicivirus-like particles in the stool, by electron microscopy.
- IgG antibodies indicate acute and past HEV infections,
- IgM antibodies can only be found in patients with acute infections
- To prove current infection the detection of HEV RNA by PCR has been established.



Control

- As for HAV, provision of
 - safe drinking water and
 - sanitary disposal of feces is required to prevent the infection.
- No vaccine is yet available globally.
- In 2011, the first vaccine to prevent hepatitis E infection was registered in China. Although it is not available globally, it could potentially become available in several other countries.



Hepatitis B

- A major cause of morbidity and mortality worldwide.
- It is estimated that more than two billion people have been or are currently infected with hepatitis B virus (HBV) and around 1 million deaths annually worldwide.
- An estimated 240 million people are chronically infected with hepatitis B (defined as hepatitis B surface antigen positive for at least 6 months).
- HBV infections is the most common cause of chronic hepatitis, liver cirrhosis and primary liver cancer worldwide.

Historical Background

- In 1966 Baruch Samuel Blumberg, An American scientist, discovered Australian antigen (HBsAg) in aborigines of Australia.
- The complete hepatitis B virus was first discovered by Dane (1970), thus referred to as “Dane particle”.



Hepatitis B Virus

- I.P: 4 weeks- 6 months
- The virus is stable at 37°C for 60 minutes and remains viable after being dried and stored at 25°C for at least one week.
- HBsAg is not destroyed by ultraviolet irradiation and viral infectivity may also resist such treatment.
- Hypochlorite or 2% Gluteraldehyde
- For 10 min. will inactivate the virus.



Epidemiology of Hepatitis B

Hepatitis B prevalence is highest in sub-Saharan Africa and East Asia, where between 5–10% of the adult population is chronically infected. High rates of chronic infections are also found in the Amazon and the southern parts of eastern and central Europe. In the Middle East and the Indian subcontinent, an estimated 2–5% of the general population is chronically infected. Less than 1% of the population in Western Europe and North America is chronically infected.



Complications

Following acute infection, approximately 5% of infected individuals fail to eliminate the virus completely.



Risk Groups of HBV infection

1. High risk group

- Immigrants and refugees from areas of high HBV endemicity.
- Clients in institutions for the developmentally disabled.
- Users of illicit parenteral drugs.
- Homosexual active men.
- Household contacts of HBV carriers.
- Patients of hemodialysis unit



Risk Groups of HBV infection

2. Intermediate risk group

- Health care workers who have frequent blood contact
- Prisoners (male)
- Staffs of institutions for the developmentally disabled
- Heterosexuals with multiple partners

3. Low risk group

Health care workers with no or infrequent blood contact



Modes of transmission of Hepatitis B

A Quantity of blood as small as 0.05 ml is enough to transmit HBV infection.

1. Percutaneous or mucosal exposure to infected blood and various body fluids, as well as through saliva, menstrual, vaginal, and seminal fluids. or parenteral transmission: (intravenous drug use)
2. Sexual transmission:
3. Maternal-neonatal transmission
 - Vertical transmission/
 - Perinatal transmission
4. Horizontal transmission (sharing sharp personal utensils)
5. Nosocomial transmission: (including needle-stick injury)
6. Organ transplantation.



Prevention & Control

1. Stopping the spread of HBV.

A. General hygienic measures:

B. Environmental measures:

This is mainly inside the hospitals.

C. Specific measures: These includes special health education programs.

2. Active immunization.

3. Passive immunization.



Prevention & Control (Cont.)

1) Active immunization

Two types of vaccine are available:

- o Serum derived-purified HBsAg from serum of HBV carriers.
- o Recombinant HBsAg- made by genetic engineering in yeasts.

2) Passive immunization (HBIG)



Hepatitis C

- The major cause of Parenterally transmitted non A non B hepatitis.
- Virology: Belong to Togavirus related to Flavi and Pesti viruses. Thus probably enveloped.
- Has RNA genome.
- Does not grow in cell culture.



Epidemiology of Hepatitis C

- HCV has a worldwide distribution.
- According to the WHO there are 130-170 million people infected with the hepatitis C virus (HCV), corresponding to 2-2.5% of the world's total population.
- Approximately 500 000 people die each year from hepatitis C-related liver diseases.
- Hepatitis C is found worldwide. The most affected regions are Africa and Central and East Asia
- There are considerable regional differences. In some countries, e.g., Egypt, the prevalence is as high as 22%



Clinical Features

- Incubation period 6-8 weeks.
- Cause a milder form of acute hepatitis than does hepatitis B
- About 15–45% of infected persons spontaneously clear the virus within 6 months of infection without any treatment.
- The remaining 55–85% of persons will develop chronic HCV infection. Of those with chronic HCV infection, the risk of cirrhosis of the liver is 15–30% within 20 years.



Transmission:

- Blood transfusion, blood products
- Organ donation
- Community acquired: mechanism unclear.
- Vertical transmission. (?)
- Sexual transmission.



Diagnosis

- Serology by ELISA for detection of Anti-HCV Ab recently available HCV-specific IgG indicates exposure, not infectivity.
- PCR detects viral genome in patients' serum.



Prevention

- Hand hygiene: including surgical hand preparation, hand washing and use of gloves;
- Safe handling and disposal of sharps and waste;
- Provision of comprehensive harm-reduction services to people who inject drugs including sterile injecting equipment;
- Testing of donated blood for hepatitis B and C (as well as HIV and syphilis);
- Training of health personnel;



Prevention(Cont.)

- **Secondary and tertiary prevention:**
- immunization with the hepatitis A and B vaccines to prevent coinfection from these hepatitis viruses to protect their liver;
- early and appropriate medical management including antiviral therapy if appropriate; and
- regular monitoring for early diagnosis of chronic liver disease.
- No vaccine is currently available.
- Interferon is now generally prescribed for the treatment of chronic hepatitis associated with HCV infection.

Hepatitis D

- Defective virus which requires Hepatitis B as a helper virus in order to replicate. Infection therefore only occurs in patients who are already infected with Hepatitis B.
- Virus particle 36 nm in diameter
- Encapsulated with HBsAg
- RNA genome



Clinical Features and Epidemiology of Hepatitis D

- Increased severity of liver disease in Hepatitis B carriers.
- Mode of transmission: Mainly blood and blood products.

Control

- HBV vaccination also protects against HDV.
- Screening of blood has reduced the risk of infection.



Hepatitis G (HGV)

- It has been classified as a Flavivirus and is distantly related to HCV
- Parenterally transmitted hepatitis.
- HGV has a similar role to HCV and should be sought in haemophilia, thalassaemia, dialysis patients, intravenous drug addicts and those handling blood. CO-infection with HCV is frequent.



References

- **Control of communicable diseases manual**, by Heymann DL, American Public Health Association, 19th edition, 2008.
- **Park's textbook of preventive and social medicine**, by Park K, Banarsidas Bhanot Publishers, 21st edition, 2011.