Hepatitis B Virus: From Viral Genome to Clinical Management and Prevention

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Key points:

- Introduction
- HBV structure and Genome
- Transmission
- Symptoms
- Diagnosis
- Prevention and Control

Introduction

Hepatitis B is an inflammatory liver disease caused by the **hepatitis B virus (HBV)** and can occur as either an acute or chronic infection. Around **30 million** new cases are reported annually, with approximately **296 million** people currently living with chronic hepatitis B. Most cases are reported in Asia and Africa, with nearly **60 million** cases in Africa alone.[1] It is one of the most common infectious diseases in Pakistan, affecting approximately **1.6%** of the population and causing around **545,000** new cases and **19,000** deaths each year.[2]

HBV has a DNA genome and is diagnosed through blood tests that detect specific viral antigens. Although hepatitis B can be effectively prevented through vaccination, there is currently no complete cure for chronic infection.

HBV Structure and Genome

HBV is a **partially double-stranded circular DNA virus** that uses **reverse transcriptase** during its replication.[3] It is an enveloped virus with a genome of approximately **3.2 kb**, consisting of a plus and a minus DNA strand enclosed within an enveloped nucleocapsid.[4] The minus strand contains a terminal protein, which is the viral DNA polymerase, covalently linked to the 5' end through a tyrosyl-DNA phosphodiester bond. The plus strand contains a short capped RNA fragment at its 5' end.[5]

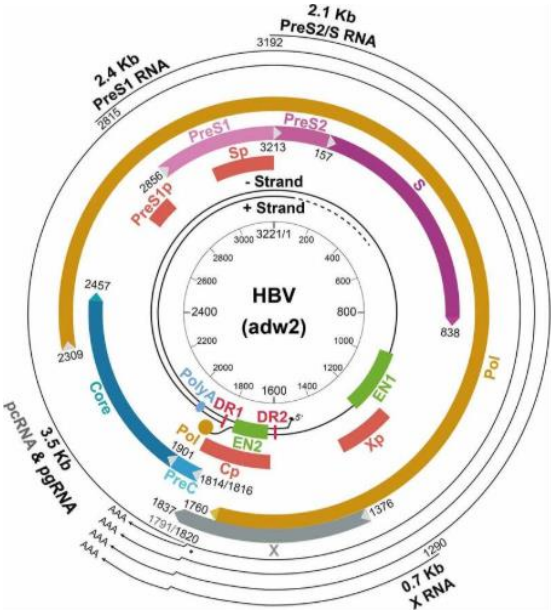


Figure 1: *Structure of HBV Genome*[5]

Transmission

Hepatitis B can be transmitted through:

- Vertical transmission (from mother to child during birth)
- Sexual contact
- Contact with contaminated needles, blood, or other sharp instruments.[6]

Symptoms

Common symptoms of HBV infection include:

- Fatigue
- Jaundice
- Dark urine
- Abdominal pain
- Nausea
- Vomiting

Diagnosis

The serological diagnosis of acute HBV infection involves detecting **Hepatitis B Surface Antigen (HBsAg)** and **Hepatitis B e Antigen (HBeAg)**. **Hepatitis B Surface Antibody (anti-HBs)** indicates immunity, while **Hepatitis B Core IgM Antibody (anti-HBc IgM)** appears at the onset of symptoms and indicates a recent or ongoing infection. The presence of **HBeAg** indicates high infectivity.[7]

Prevention and Control

1. Hepatitis B vaccination is recommended for newborns, infants, children, and adults at risk of infection.
2. Infected individuals should seek medical advice and follow the recommended treatment and preventive measures.
3. Contaminated needles, medical equipment, and other instruments should be properly sterilized or safely disposed of.
4. Regular screening and vaccination can help prevent the spread of hepatitis B.[8]

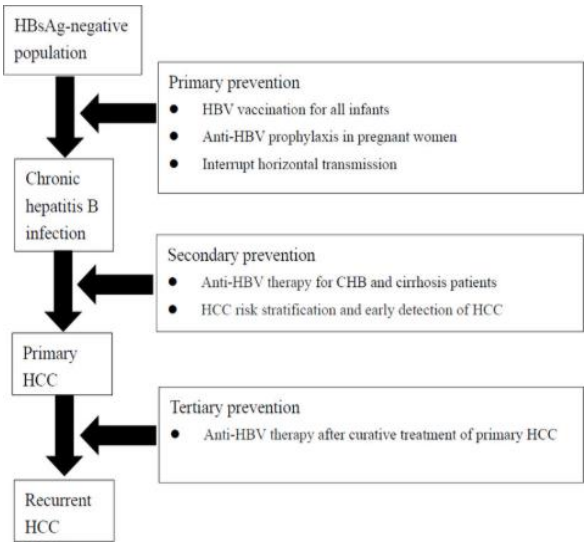


Figure 2: *Prevention of HBV.*[5]

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