

Epidemiology and Prevention of Viral Hepatitis

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PART 2

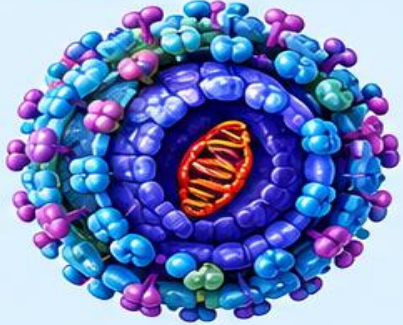
Blood-borne hepatitis: B, C and D

Vaccination, safe health care, screening, linkage and treatment

Hepatitis B (HBV)

Blood-borne and perinatal infection
Preventable by effective vaccination

The Virus



Hepatitis B virus (HBV)

- DNA virus (hepadnavirus)
- Multiple serotypes (A–J)
- Highly infectious and can cause chronic infection

Transmission



Perinatal (mother-to-child)
(highest risk of chronicity)



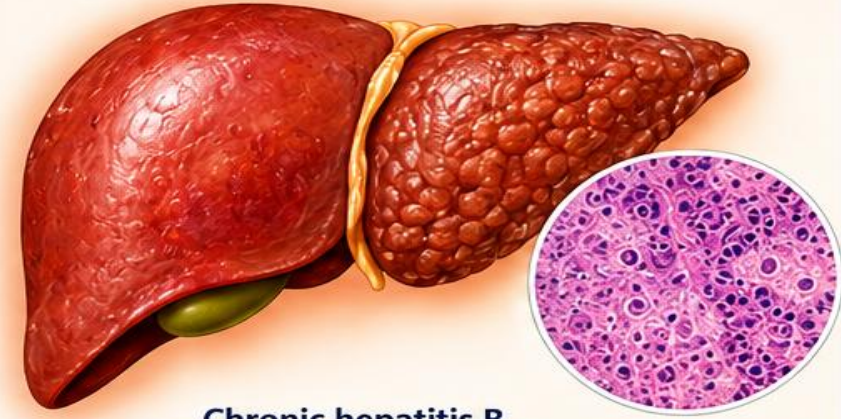
Blood and blood products
(transfusion, unsafe injections)



Sexual contact
(multiple partners, unprotected sex)



Healthcare / occupational
(needlestick, contaminated equipment)



Chronic hepatitis B
can lead to cirrhosis and hepatocellular carcinoma

Epidemiology



Worldwide distribution
(high in Asia, Africa, Pacific)

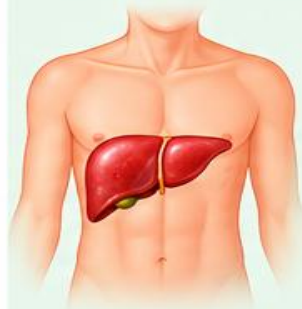


High endemicity
in Asia and sub-Saharan Africa
(intermediate in Middle East)



High risk of chronicity
if infected at birth or in early childhood
(>90%), lower in adults (5–10%)

Clinical features



- Often asymptomatic
- Acute hepatitis (fever, jaundice, malaise)
- Can become chronic (≈ 5–10% in infants, 5–10% in adults)
- Chronic infection may progress to cirrhosis, liver failure and hepatocellular carcinoma

Prevention and control



Vaccination
(birth dose + complete series)



Screening of blood, organs and tissues



Safe injection and infection control



Safe sexual practices



Testing and treatment
of infected persons

Key points



Effective vaccine
available



Can cause
chronic infection



Major cause of
cirrhosis and liver cancer



Prevent mother-to-child
transmission



Safe blood and
injection practices

Age at HBV infection determines the risk of chronic disease

Infection in infancy

≈95%

may progress to chronic infection

Infection in adulthood

<5%

progresses to chronic infection

Public-health implication: prevent infection at birth and in early childhood before the lifelong reservoir is established.

HBV prevention must cover the whole transmission network

PERINATAL

Mother to infant at delivery

EARLY CHILDHOOD

Close household contact in endemic settings

HEALTH CARE

Unsafe injections, sharps, dialysis or procedures

SEXUAL / BLOOD

Unprotected sex, shared injecting equipment, tattooing/piercing

HBV is not spread by casual social contact, food or water.

A three-test panel identifies infection, immunity and susceptibility

Interpretation	HBsAg	Total anti-HBc	Anti-HBs	Programme action
Current infection	+	+	–	Link to HBV evaluation and contacts
Resolved infection	–	+	+	Counsel; consider reactivation risk if immunosuppressed
Immune by vaccination	–	–	+	No infection; document immunity
Susceptible	–	–	–	Offer vaccination
Possible isolated core antibody	–	+	–	Clarify with history and additional testing

Acute infection requires IgM anti-HBc; chronic infection is defined by persistence, not by a single clinical episode.

Preventing mother-to-child HBV requires a complete cascade

- 1 Test every pregnancy**
HBsAg early in antenatal care
- 2 Assess high viral load**
Link positive mothers for HBV DNA or validated alternative assessment
- 3 Prevent transmission**
Maternal antiviral prophylaxis when indicated
- 4 Vaccinate promptly**
Birth dose within 24 hours, then complete the series
- 5 Close the loop**
Infant follow-up and post-vaccination testing where indicated



HBV vaccination is a life-course Programme

Infants

Universal birth dose as soon as possible—preferably within 24 hours—followed by two or three additional doses according to the national schedule.

Unvaccinated people at risk

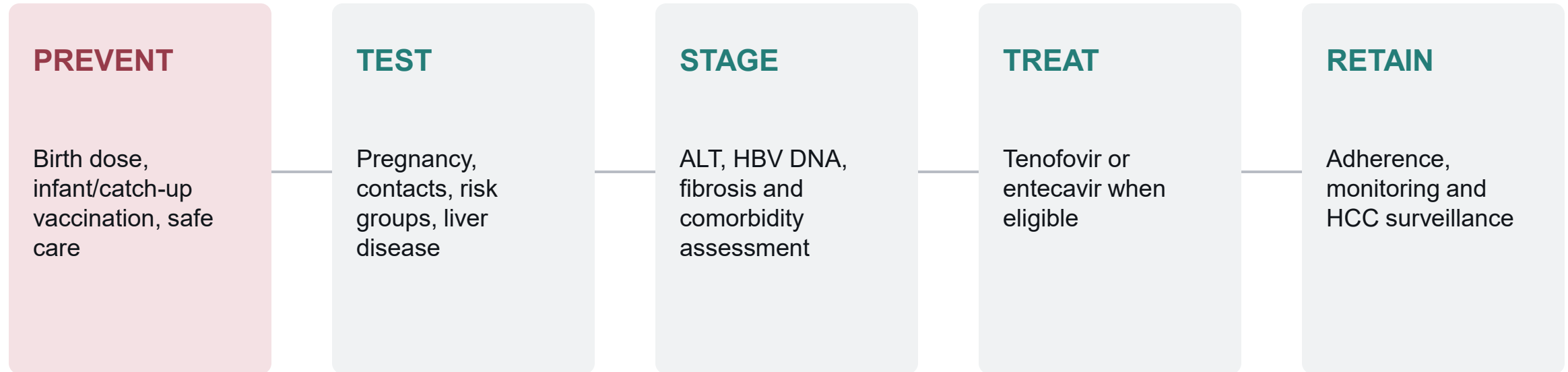
Catch-up vaccination should reach household/sexual contacts, people with repeated blood exposure, dialysis, injecting-drug exposure and other locally defined risk groups.

Health-care workers

Vaccinate before exposure where possible. Document the series and post-vaccination anti-HBs for workers with occupational blood exposure according to policy.

Testing should not become a barrier to vaccinating a susceptible person.

HBV control fails when any step in the cascade is missed



Coverage must be measured at every transition—not only at vaccination.

Screening policy must match prevalence and Programme capacity

WHO approach

Offer population HBsAg testing where adult prevalence is $>2\%$

Test all pregnant women and blood donors

Test people with liver disease, contacts and key risk groups

Always link positive results to care

Example of expanded policy

CDC recommends one-time triple-panel screening for all adults ≥ 18 years

Universal approaches reduce dependence on disclosure of stigmatized risks

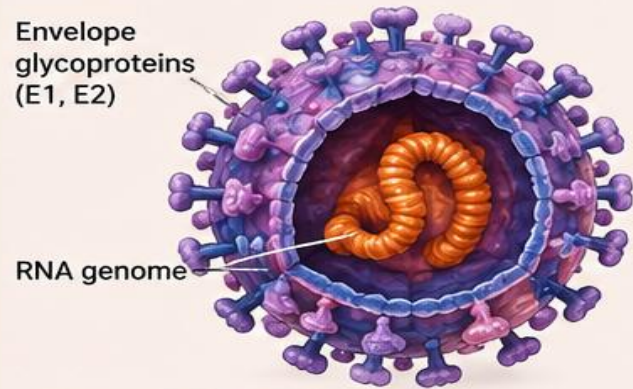
Local adoption requires cost, prevalence and delivery assessment

A screening test without confirmatory testing, counselling and linkage is an incomplete programme.

Hepatitis C (HCV)

Blood-borne virus causing chronic hepatitis and liver cancer

The Virus



- Hepatitis C virus (HCV)
- Enveloped, single-stranded RNA virus
- Multiple genotypes (1–6)

Acute infection

Chronic hepatitis

Cirrhosis

Liver cancer (HCC)



Transmission



Clinical Features

Acute infection

- Usually asymptomatic (70–80%)
- Mild, non-specific symptoms when present

Chronic infection

- Develops in 55–85% of cases
- Silent progression for years
- Can lead to cirrhosis, decompensation and HCC

Diagnosis

Anti-HCV antibody (screening test)



HCV RNA (PCR) (confirms current infection)



Genotype and viral load (useful before treatment)

Prevention and Control



Safe injections and infection control in all healthcare settings



Safe blood and blood product screening



Harm-reduction services for people who inject drugs (sterile equipment, OAT)



Safe tattooing, piercing and personal hygiene practices



Safer sexual practices (especially for high-risk groups)

Treatment and Outcome



- Direct-acting antivirals (DAAs)
- Cure rates >95%
- Short course (8–12 weeks)
- Treats all genotypes
- Prevents cirrhosis and HCC when given early



No vaccine available
→ prevention depends on reducing exposure and treating infected individuals.

Hepatitis C is a preventable and curable cause of chronic liver disease.

HCV transmission is mainly preventable blood exposure

Unsafe health care

Reuse or inadequate sterilization of needles, syringes and medical equipment

Injecting drug use

Shared injecting equipment; globally about 44% of new HCV infections

Unscreened blood

Transfusion risk where universal quality-assured screening is incomplete

Less common routes

Perinatal transmission and sexual practices involving blood exposure

HCV is not transmitted through food, water, breast milk or ordinary social contact.

Most acute HCV is silent, and most infections become chronic

Exposure

≈30%

Spontaneously clear infection within 6 months (range 15–45%).

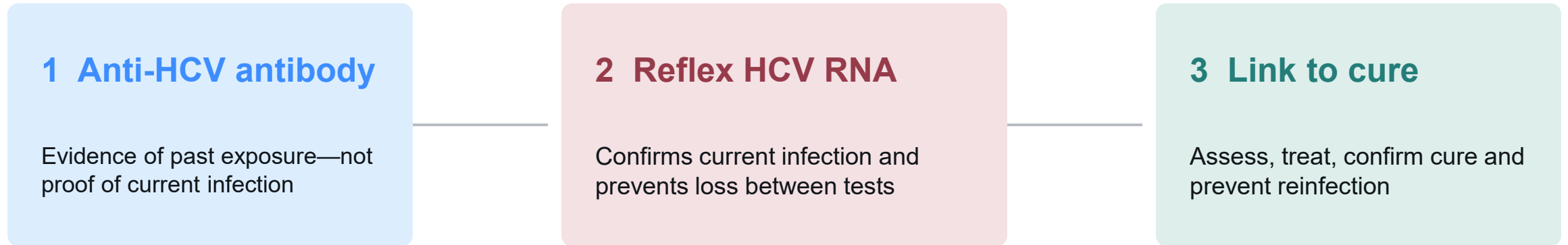
≈70%

Develop chronic HCV infection (range 55–85%).

Symptoms and ALT alone cannot rule out infection.

Among chronic infection, 15–30% develop cirrhosis within 20 years.

HCV diagnosis requires confirmation of current viraemia



A reactive antibody with negative RNA means no current viraemia—resolved infection or successful treatment.

Testing should reach people before liver disease appears



Who should be offered testing?

- People with current or past injecting-drug exposure
- Dialysis and repeated blood exposure
- Recipients of unscreened or historically unsafe blood products
- People living with HIV or liver disease
- Children born to mothers with HCV
- Anyone with a recognized occupational or procedural exposure

Some countries also use universal adult and pregnancy screening; local policy should be explicit.

HCV cure is both clinical care and transmission control

>95%

can be cured with direct-acting
antivirals

Usually 8–12 weeks

Population effect

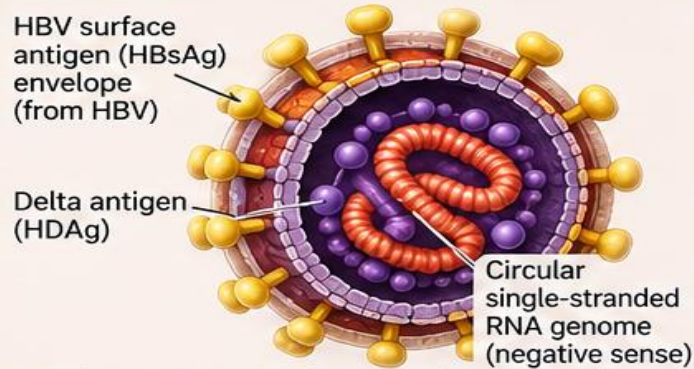
- Prevents cirrhosis and liver cancer
- Removes sources of ongoing transmission
- Creates a reason to normalize testing
- Requires reinfection prevention and continued harm reduction

Elimination requires case-finding + affordable treatment + retention—not treatment alone.

Hepatitis D (HDV)

A defective virus that requires Hepatitis B virus for its replication

The Virus



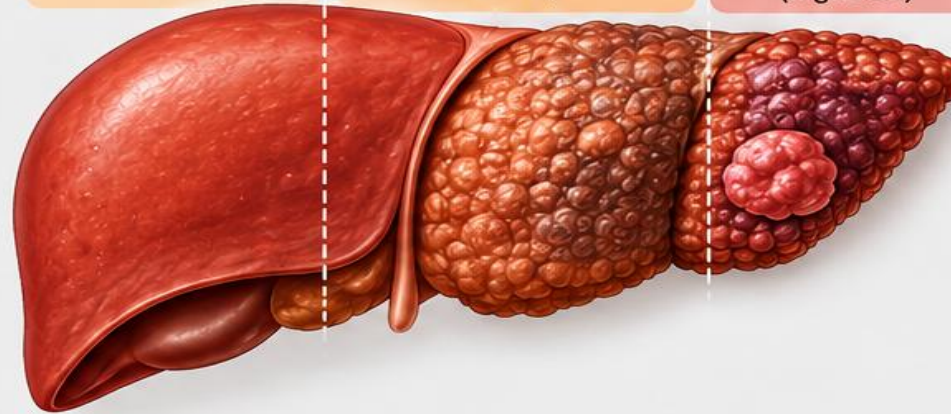
- Defective RNA virus (smallest human virus)
- Requires HBV (HBsAg) for its envelope and replication
- Two forms:
 - Co-infection with HBV
 - Superinfection in a person with chronic HBV (more severe)

Pathogenesis and Liver Damage

Acute hepatitis
(especially in
co-infection)

Rapid progression
to chronic hepatitis
(more severe than HBV
alone)

Cirrhosis and
hepatocellular
carcinoma
(high risk)



Transmission



Exposure to
infected blood
(transfusion)



Unsafe injections
and medical
procedures



Unsafe tattooing
and body piercing



Perinatal
transmission
(less common)



Sexual
transmission
(less common)



Sharing personal
items (razors,
toothbrushes)

Clinical Features

Co-infection with HBV

- Similar to acute HBV
- Usually self-limiting
- Low risk of chronicity (~5%)

Superinfection in chronic HBV

- More severe acute hepatitis
- High risk of chronic infection (70–90%)
- Faster progression to cirrhosis
- Higher risk of hepatocellular carcinoma compared with HBV alone

Diagnosis

Screen for HBV infection
(HBsAg)

Anti-HDV antibody
(screening test)

HDV RNA (PCR)
(confirms active infection)

- Test for HDV in all HBsAg-positive persons with elevated ALT, severe hepatitis or risk factors.
- HDV cannot infect without HBV.

Prevention and Control



Hepatitis B vaccination
(prevents HDV)



Safe blood and blood product
screening



Safe injections and infection
control in healthcare settings



Avoid sharing personal items
(razors, toothbrushes)



Safer sexual practices
(especially for high-risk groups)

Treatment and Outcome

- Currently no approved curative treatment.
- Pegylated interferon- α may achieve sustained virologic response in a minority of patients.
- Nucleos(t)ide analogues (e.g. tenofovir, entecavir) control HBV but do not clear HDV.
- Management is by specialists with monitoring for cirrhosis and HCC.

**Prevention depends on
hepatitis B vaccination.**



Hepatitis D occurs only in people infected with hepatitis B and leads to more severe liver disease.

HDV is the most severe chronic viral hepatitis

≈12 million

people affected globally

≈5%

of people with chronic HBV

Why it matters

HDV requires HBsAg, accelerates cirrhosis and liver cancer, and has been classified as carcinogenic to humans.

HBV vaccination prevents HDV infection—but does not protect a person who already has chronic HBV from HDV superinfection.

HDV coinfection and superinfection have different trajectories

COINFECTION

- HBV and HDV acquired together.
- Acute hepatitis may be severe, but progression to chronic HDV is less common when both infections resolve.

SUPERINFECTION

- HDV acquired by a person with chronic HBV.
- It is more likely to become chronic and to accelerate cirrhosis, liver failure and hepatocellular carcinoma.

Public-health action

Vaccinate susceptible contacts, reduce blood exposure and test people with HBV according to policy and clinical indication.

Safe health care prevents HBV and HCV transmission

Minimum system standards

- Use sterile single-use needles and syringes
- Never reuse injection equipment
- Sterilize reusable instruments effectively
- Dispose of sharps immediately at the point of use
- Audit dialysis, dental and procedural infection control
- Screen every blood donation for HBV and HCV

Safety depends on supplies, workflow, training and monitoring.



A sharps exposure requires immediate, protocol-based action

1

FIRST AID

Wash skin; flush mucosa. Do not squeeze or use caustic agents.

2

REPORT

Notify occupational health immediately and document the exposure.

3

ASSESS

Evaluate the source, exposure type and worker vaccination/immune status.

4

ACT

Provide HBV vaccine/HBIG when indicated; no HCV prophylaxis is recommended.

5

FOLLOW

Baseline and follow-up tests; HCV RNA at 3–6 weeks when indicated.

Do not wait for symptoms.

Every prevention level has a hepatitis example

PRIMORDIAL / PRIMARY

Safe water and sanitation;
HBV/HAV vaccination;
safe injections;
blood screening;
condom access;
occupational safety.

SECONDARY

Antenatal HBV testing;
risk-based or universal
screening policy;
reflex HCV RNA;
contact testing;

TERTIARY

HBV antiviral treatment,
HCV cure, cirrhosis care,
HCC surveillance,
disability prevention and
palliative support.

Elimination needs all three levels at the same time.

The 2030 targets measure incidence, mortality and service coverage

95%

**reduction in new chronic HBV
infections**

Compared with 2015

80%

reduction in new HCV infections

Compared with 2015

65%

reduction in hepatitis mortality

Compared with 2015

Service ambition: diagnose 90% and treat 80% of eligible people—while protecting equity and quality.

A practical elimination package for Iraq

Close the birth-dose gap

Link maternity registers to immunization; vaccinate before discharge; monitor ≤ 24 -hour coverage.

Strengthen maternal HBV prevention

Universal antenatal HBsAg testing, viral-load pathway, prophylaxis and infant follow-up.

Protect health-care settings

Injection safety, dialysis/dental IPC, occupational vaccination and exposure management.

Expand HCV test-and-cure

Target priority settings first; use reflex RNA and simplified referral/PHC linkage.

Improve surveillance

Separate acute, chronic and laboratory indicators; deduplicate cases; analyze by governorate and risk setting.

Prepare for enteric outbreaks

Water monitoring, rapid jaundice alerts, line lists, laboratory confirmation and coordinated WASH response.

Monitor the cascade—not only the number of reported cases

Domain	Example indicator	Interpretation
Prevention	% newborns receiving HepB birth dose within 24 h	Maternity–immunization performance
Testing	% priority population tested; positivity rate	Reach and yield
Confirmation	% anti-HCV positive with reflex RNA completed	Diagnostic completion
Linkage	% confirmed cases attending care within 30 days	Referral effectiveness
Treatment	% eligible HBV treated; % HCV started and cured	Clinical Programme coverage
Outcome	Incidence, mortality, cirrhosis/HCC and outbreak duration	Population impact
Equity/quality	Coverage by governorate, sex, age, displacement and risk setting	Who is being missed

Design a hepatitis improvement project for a Baghdad PHC district

Scenario

The district has 52% timely HepB birth-dose coverage, incomplete antenatal HBsAg documentation, several dialysis units and no routine measure of HCV reflex RNA completion.

Your team has six months and must choose one measurable priority.

Build the plan

- Define the target population and baseline
- Choose one intervention and responsible service.
- Specify process and outcome indicators
- Plan data sources and monthly review
- Identify one equity risk and one unintended consequence

QUIZ

A 23-year-old medical student sustains a needlestick from a patient whose status is unknown.

She completed an HBV vaccine series but has no documented post-vaccination anti-HBs. What is the best immediate approach?

A. Wait for symptoms before testing

B. Wash the site, report immediately, assess source and student , and follow the exposure protocol

C. Give hepatitis C immune globulin

D. Start direct-acting antivirals as HCV prophylaxis

E. Repeat the entire HBV vaccine series without assessing the exposure

Five messages to retain

1

Route determines control

A/E: WASH and outbreak control. B/C/D: vaccination, safe care, screening and treatment.

2

Birth timing matters

HBV infection in infancy commonly becomes chronic; the ≤ 24 -hour birth dose is crucial.

3

Silence is common

Symptoms cannot identify most chronic HBV/HCV; programmes need deliberate testing and linkage.

4

Cure is possible

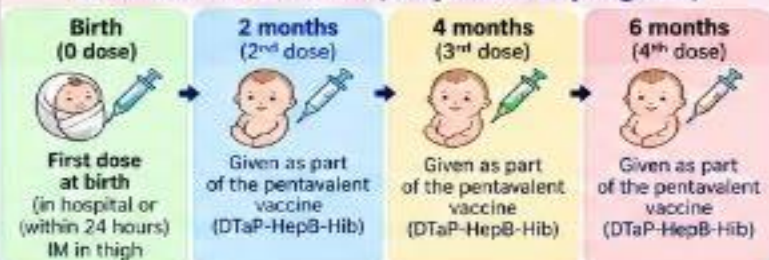
HCV therapy cures $>95\%$, while HBV treatment prevents progression and death.

5

Measure the cascade

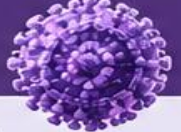
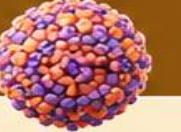
Coverage, confirmation, linkage, treatment, equity and impact are all required for elimination.

Viral Hepatitis Vaccines: Types, Schedule, Key Points and Availability in Iraq

 Hepatitis type	 Hepatitis A vaccine (HAV)	 Hepatitis B vaccine (HBV)	 Hepatitis E vaccine (HEV)
 Vaccine type	Inactivated (inactivated whole virus vaccine)	Recombinant (hepatitis B surface antigen, HBsAg)	Recombinant (HEV 239 virus-like particles)
 Available brands (in Iraq)	Havrix®, Vaqta® 	Engerix-B®, Euvax B®, Heberbiovac HB® (also combination vaccines with other antigens) 	Hecolin® (Xiamen Innovax, China) 
 Vaccine composition	Inactivated hepatitis A virus (Alum adjuvant)	Recombinant HBsAg (alum adjuvant)	Recombinant HEV 239 (virus-like particles) (alum adjuvant)
 Standard schedule (adults)	2 doses: 0 and 6–12 months	3 doses: 0, 1 and 6 months (20 µg per dose)	3 doses: 0, 1 and 6 months (0.5 mL per dose)
 Children schedule	From 12 months of age: 2 doses: 0 and 6–12 months	Schedule for children (Iraq national program) 	Not routinely used in children. Licensed for ≥ 16 years (in China). Not part of routine immunization in Iraq.
 High-risk groups	- Travellers to endemic areas - Chronic liver disease - Men who have sex with men - People who use illicit drugs - Household/close contacts of HAV cases	- Healthcare workers - Household/sexual contacts of HBV cases - Patients with chronic liver disease, CKD, diabetes - People who use illicit drugs - Men who have sex with men - Travellers, and others	- People living in or travelling to HEV endemic areas - Humanitarian workers - People with chronic liver disease (particularly advanced liver disease) - Pregnant women in endemic areas (to prevent infection before pregnancy)
 Key points	- Provides long-term protection (≥ 20 years in most studies) - Post-exposure prophylaxis possible within 2 weeks (vaccine ± immunoglobulin)	- Safe and highly effective (>95% after 3 doses) - Check anti-HBs 1–2 months after last dose in high-risk groups (target ≥10 mIU/mL) - Booster not routinely needed in immunocompetent individuals	- Provides high and long-lasting protection (~95% efficacy) - Recommended for people at high risk of HEV infection - Not part of routine immunization programs in most countries, including Iraq.
 Storage	2–8°C (refrigerated) Do not freeze	2–8°C (refrigerated) Do not freeze	2–8°C (refrigerated) Do not freeze
 Availability in Iraq (2026)	 Available in private sector - Major private pharmacies - Travel clinics in Baghdad and other cities - Not part of routine public immunization.	 Available widely - Routine infant program (public sector) - Available in private sector for adults (Engerix-B, Euvax B and others).	 Limited availability in Iraq - Not part of routine public immunization. - May be available in some private sector pharmacies on request (supply is limited).

Diagnosis of Viral Hepatitis (A, B, C, D and E)

Key laboratory tests and interpretation

Feature	Hepatitis A (HAV) 	Hepatitis B (HBV) 	Hepatitis C (HCV) 	Hepatitis D (HDV) 	Hepatitis E (HEV) 
Specimen	Serum	Serum	Serum	Serum	Serum
Primary diagnostic test(s)	• Anti-HAV IgM (acute infection) • Anti-HAV IgG (past infection or immunity)	• HBsAg (current infection) • Anti-HBc IgM (acute infection) • Anti-HBc IgG (past or chronic infection)	• Anti-HCV antibody (screening test) • HCV RNA (PCR) (confirms current infection)	• Anti-HDV IgM (acute infection) • Anti-HDV IgG (past or chronic infection) • HDV RNA (PCR) (confirms active infection)	• Anti-HEV IgM (acute infection) • Anti-HEV IgG (past infection) • HEV RNA (PCR) (early infection, immunocompromised)
Interpretation of positive result	Anti-HAV IgM positive = acute HAV infection	HBsAg positive = current HBV infection (acute or chronic)	Anti-HCV positive = exposure to HCV Confirm with HCV RNA for current infection	Anti-HDV positive = HDV infection (occurs only in persons with HBV infection)	Anti-HEV IgM positive = acute HEV infection
Additional useful tests	ALT/AST (total bilirubin)	• HBeAg (replication) • HBV DNA (viral load) • Anti-HBe • Liver function tests	• HCV RNA (viral load) • Genotype (before treatment) • Liver function tests	• HBsAg (must be positive) • HDV RNA (viral load) • Liver function tests	ALT/AST (total bilirubin)
Window period (approximate)	~2–6 weeks	~4–12 weeks (HBsAg appears early)	~6–10 weeks (antibody); earlier with HCV RNA (~1–2 weeks)	Variable	~2–8 weeks
Use in screening programs	Not routinely screened (in selected high-risk groups only)	Yes (e.g. pregnant women, blood donors, high-risk groups)	Yes (anti-HCV for at-risk groups; confirm with RNA)	Test only HBsAg-positive persons when indicated (e.g. high risk or unexplained severe hepatitis)	Not routinely screened (from selective testing during outbreaks or in pregnancy)
Key point	Serology (IgM) confirms acute infection.	HBsAg is the key marker for current infection.	Anti-HCV requires PCR confirmation.	Test for HDV only in HBsAg-positive individuals.	Serology (IgM) confirms acute infection.

Important notes

- **HAV** and **HEV** do not cause chronic infection.
- **HBV**, **HCV** and **HDV** can cause chronic infection.
- **HDV** occurs only in the presence of **HBV** (co-infection or superinfection).

- A positive antibody test (anti-HAV, anti-HCV, anti-HEV) indicates exposure, not necessarily current infection. Use IgM or PCR to confirm acute or current infection.
- Interpretation of HBV serology requires understanding of all markers together (HBsAg, anti-HBs, anti-HBc IgM/IgG, HBeAg, anti-HBe).

THANK YOU