

Epidemiology and Prevention of Viral Hepatitis

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Part -I

What you should be able to do

- 01** _____ Differentiate hepatitis A–E by route, chronicity, risk groups and prevention.
- 02** _____ Describe the global and Iraqi burden using person, place and time.
- 03** _____ Explain how vaccination, WASH, blood safety and injection safety interrupt transmission.
- 04** _____ Select appropriate screening tests and interpret the main HBV serologic patterns.
- 05** _____ Investigate a suspected enteric hepatitis outbreak using standard epidemiologic steps.
- 06** _____ Design a PHC/community elimination package and monitoring indicators.

One organ, two very different public-health patterns

ENTERIC HEPATITIS

A and E

Faecal–oral transmission

Acute disease and outbreaks

WASH=Water, sanitation and hygiene

Food safety and vaccination

BLOOD-BORNE HEPATITIS

B, C and D

Blood/body-fluid exposure

Silent chronic infection

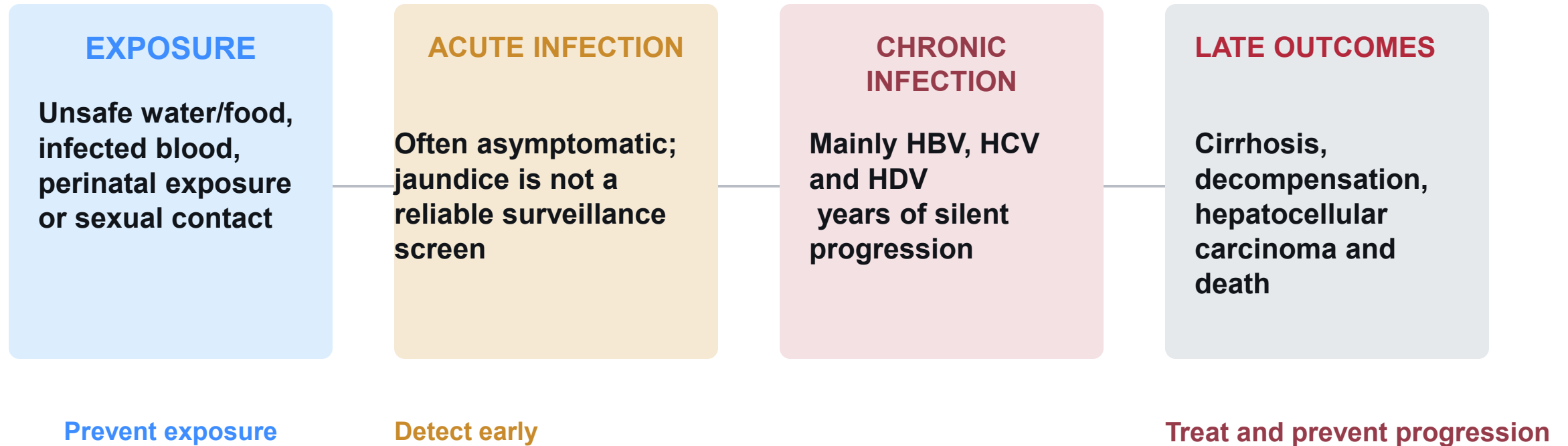
Cirrhosis, liver cancer and long-term care cascade

The route determines the intervention.

The five viruses require different control strategies

Virus	Main route	Chronic infection	Vaccine	Public-health priority
HAV	Faecal–oral	No	Yes	WASH, food safety, outbreak control
HBV	Perinatal; blood; sexual	Yes	Yes	Birth dose, infant series, testing and treatment
HCV	Blood-borne	Yes	No	Safe care, harm reduction, testing and cure
HDV	As HBV; requires HBV	Yes	Prevented by HBV vaccine	Test people with HBV when indicated
HEV	Faecal–oral; mainly water	Usually no	Limited availability	WASH; pregnancy/outbreak protection

Natural history identifies the prevention window



Describe viral hepatitis by person, place and time

PERSON

Age at infection shapes HBV chronicity. Pregnancy increases HEV severity. Risk also clusters among people exposed to unsafe injections, dialysis, transfusion, incarceration or injecting drug use.

PLACE

HAV/HEV rise where water and sanitation fail. HBV/HCV burdens reflect vaccination, infection-control, blood safety, harm-reduction and access to testing and treatment.

TIME

Outbreak curves reveal common-source or propagated spread. Long latency means today's cirrhosis may reflect exposures decades earlier.

A useful description leads directly to a targeted intervention.

Viral hepatitis remains a major preventable cause of death

240 million

people living with chronic HBV

2.9% of the global population

47 million

people living with viraemic HCV

0.6% of the global population

1.3 million

HBV/HCV deaths in 2024

Mostly cirrhosis and liver cancer

The burden is chronic, often silent and highly unequal.

Incidence is falling, but elimination is still off track

New infections in 2024

0.9 million

new chronic HBV infections

0.9 million

new HCV infections

Progress

HBV incidence fell 32% from 2015

HCV incidence fell only 8%

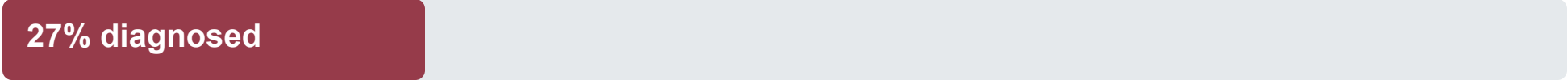
HBV deaths rose 17%

HCV deaths fell 12%

Fewer infections do not automatically produce fewer deaths when diagnosis and treatment remain late.

The largest failure is the diagnosis-to-treatment gap

HBV



A horizontal bar chart for HBV. The bar is divided into two segments: a dark red segment on the left representing 27% diagnosed, and a light grey segment on the right representing the remaining 73%.

27% diagnosed

Only 4.3% of all people with HBV were on treatment

HCV



A horizontal bar chart for HCV. The bar is divided into two segments: a blue segment on the left representing treatment expansion, and a light grey segment on the right representing 11 million untreated people.

Treatment has expanded, but 11 million diagnosed people remained untreated in 2024

Public-health response Normalize testing, use reflex confirmation, simplify linkage and integrate long-term hepatitis services into primary care.

Transmission is produced by systems, not only individual behavior

Water and sanitation

Safe water, sewage disposal, food hygiene and displacement shape HAV/HEV risk.

Health-care quality

Injection practice, sterilization, dialysis IPC and dental safety shape HBV/HCV risk.

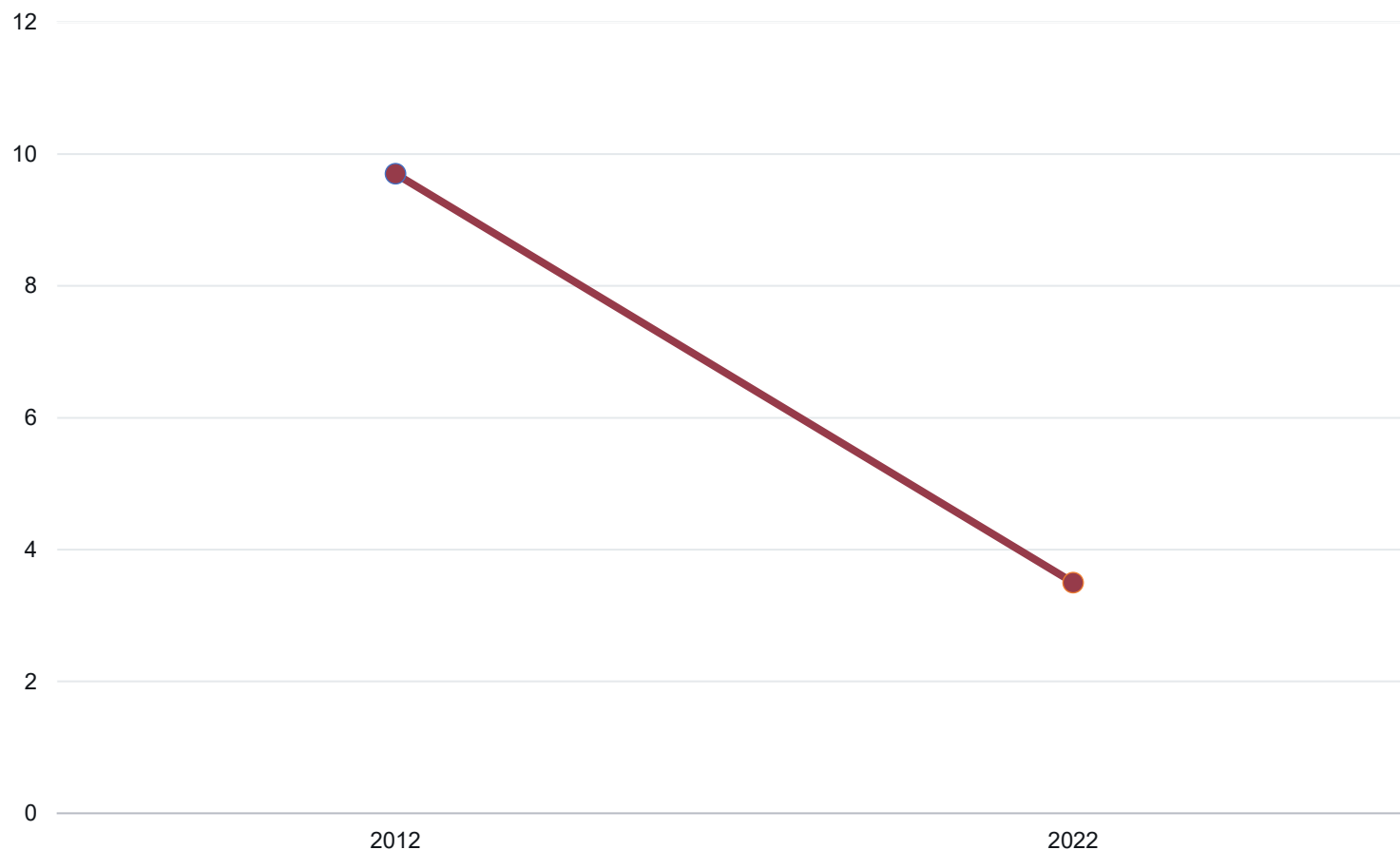
Maternal–newborn services

Antenatal testing, timely birth dose and follow-up prevent chronic HBV.

Blood and harm reduction

Screened donations, sterile equipment and services for PWID reduce blood-borne spread.

Reported HBV incidence in Iraq fell markedly from 2012 to 2022



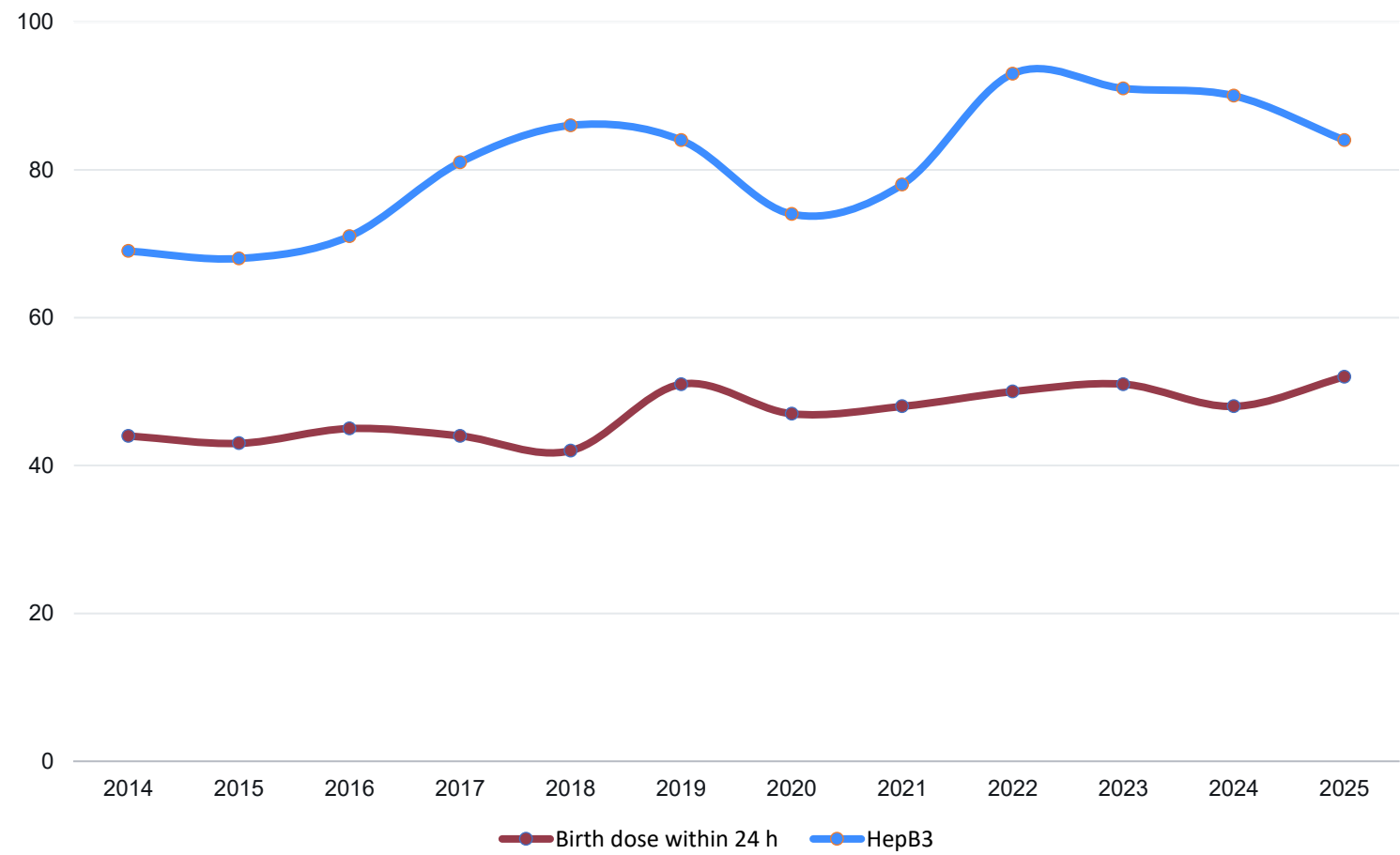
9.7 → 3.5

cases per 100,000

Interpretation

The decline was seen in both sexes and was strongest in young children after 2017—consistent with vaccination impact, while older adults retained higher incidence.

Iraq's main vaccination gap is the timely birth dose



52%
2025 timely birth dose

84%
2025 HepB3 coverage

Estimates have data-quality limitations; coverage should be verified with high-quality survey and programme data.

Low population prevalence can hide high-risk settings

Targeted surveillance and testing should focus on where exposure concentrates.

Maternal–newborn

Pregnant women, infants born to HBsAg-positive mothers, birth-dose timeliness

Health care

Dialysis, frequent transfusion, dental/invasive care and occupational exposure

Closed or underserved settings

Prisons, displacement, limited access to sterile equipment and continuity of care

Blood and historical exposure

People transfused before modern screening and patients requiring repeated blood products

Interpret Iraqi hepatitis data with four questions

- | | | |
|----------|-------------------------------|--|
| 1 | What is the numerator? | Notified acute cases, HBsAg positivity, anti-HCV positivity and HCV RNA positivity are not equivalent. |
| 2 | Who was tested? | Blood donors and hospital patients do not represent the general population. |
| 3 | What changed? | Vaccination, testing intensity, reporting, conflict, displacement and access can alter trends. |
| 4 | What is missing? | Subclinical infection, private-sector care, incomplete linkage and absent denominators can bias estimates. |

Enteric hepatitis A and E

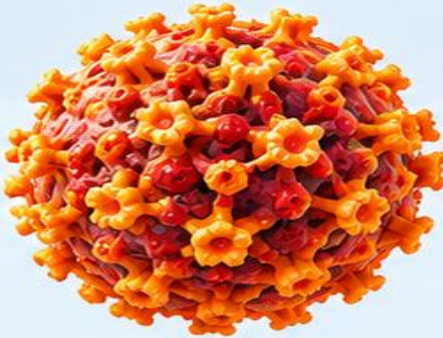
Acute infection, outbreaks, WASH and vaccination

Hepatitis A (HAV)

Acute, self-limiting enteric hepatitis
Preventable by vaccine and improved sanitation

Virus

- Non-enveloped RNA virus (Picornaviridae)
- Single serotype
- Highly resistant in environment

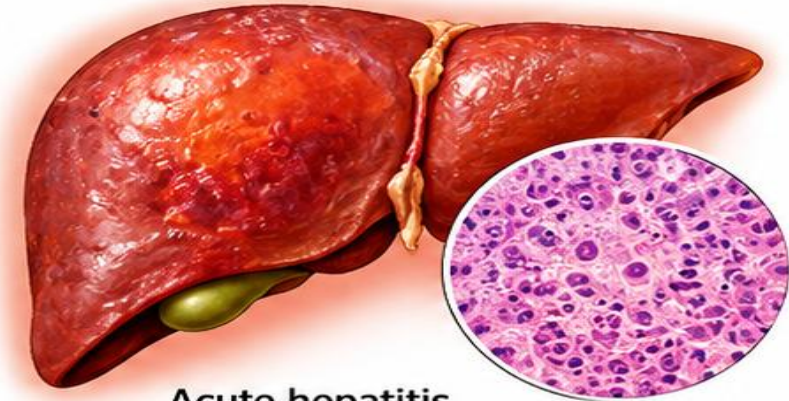


Hepatitis A virus (HAV)

Transmission Faecal–oral route



- Contaminated water
- Contaminated food (e.g. raw vegetables, shellfish)
- Person-to-person (close contact)
- Outbreaks in settings with poor sanitation



Acute hepatitis with hepatocellular inflammation

Epidemiology



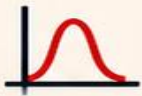
Worldwide distribution



Common in low- and middle-income countries



Affects all age groups



Outbreaks associated with unsafe water/food and poor sanitation

Clinical features



- Incubation: 15–50 days (average 28–30)
- Abrupt onset of fever, malaise, anorexia, nausea, vomiting
- Jaundice, dark urine, pale stools
- Usually self-limiting (weeks to months)
- No chronic infection
- Severe or fulminant hepatitis is rare (more likely in older adults or those with underlying liver disease)

Prevention



Vaccination
(Inactivated HAV vaccine)
– 2 doses



Safe water and sanitation (WASH)



Food safety
(well-cooked food, safe seafood)



Hand hygiene

Key points



Acute, self-limiting disease



No chronic infection



Outbreaks related to unsafe water/food



Effective vaccine available



Improve sanitation and food safety to prevent transmission

HAV is usually mild in children but more severe with age

14–28 days

usual incubation period

Children <6 years

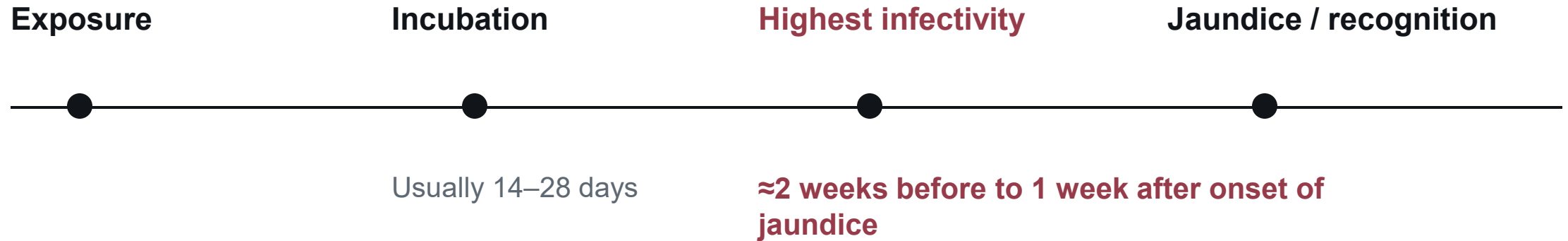
Most infections are asymptomatic; only about 10% develop jaundice. Unrecognized infection can still transmit HAV.

Older children and adults

Symptoms and jaundice are more common. Severity and fatal outcomes rise with age and underlying liver disease.

HAV does not cause chronic hepatitis
Recovery usually produces lifelong immunity.

HAV transmission often begins before jaundice appears



Implication: waiting for visible jaundice is too late for early contact assessment and food/water control.

WASH measures interrupt both HAV and HEV transmission

Community actions

- Protect drinking-water sources and monitor quality
- Ensure sewage disposal and safe food handling
- Provide handwashing facilities and soap
- Communicate rapidly during outbreaks
- Prioritize camps, displacement and disrupted services

Education works best when safe infrastructure is available.



HAV vaccination complements—not replaces—WASH

Pre-exposure

Use according to national policy and local epidemiology. Priority may include susceptible travellers, people with chronic liver disease and outbreak-prone risk groups.

Post-exposure

Assess close contacts promptly. Vaccine, and immunoglobulin for selected higher-risk people, is most useful when given within 2 weeks of exposure.

Programme design

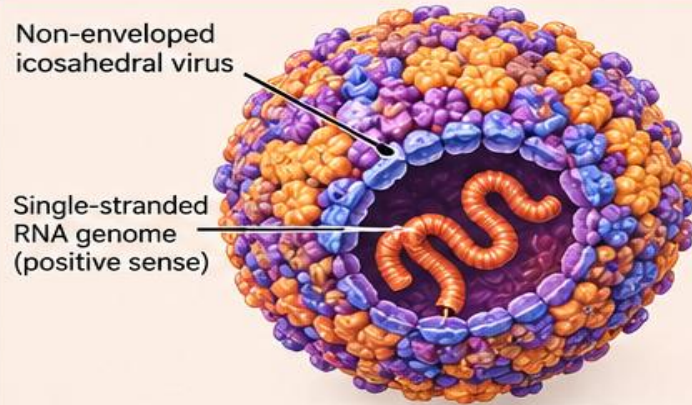
Do not rely on occupation labels alone. Define exposure, susceptibility, feasibility, equity and the outbreak objective.

The community decision depends on epidemiology and policy, not on a single universal schedule.

Hepatitis E (HEV)

An enteric virus causing acute hepatitis and outbreaks, with high risk in pregnancy

The Virus



- Hepatitis E virus (HEV)
- Non-enveloped, single-stranded RNA virus (Hepeviridae family)
- Four main genotypes: 1, 2 (humans only) 3, 4 (zoonotic; animals such as pigs)

Transmission

Faecal-oral transmission (main route)



Other (less common) routes



Clinical Features

Typical presentation

- Acute hepatitis (similar to hepatitis A)
- Often self-limiting (2–6 weeks)
- Jaundice, fever, malaise, nausea, abdominal pain

Severe disease

- Higher risk in pregnancy (particularly 3rd trimester)
- Can cause acute liver failure with high maternal mortality (10–30%)
- Higher severity during outbreaks in vulnerable populations

Diagnosis

Anti-HEV IgM

(diagnostic test for acute infection)

Anti-HEV IgG

(indicates past infection)

HEV RNA (PCR)

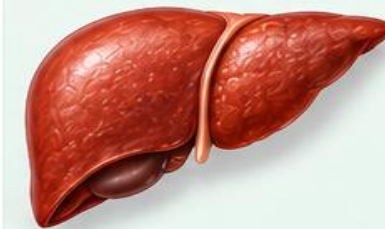
(useful in early infection and in immunocompromised)



Prevention and Control



Outcome



- Usually no chronic infection
- Complete recovery in most cases
- Severe outcomes in pregnant women and immunocompromised individuals

No widely available vaccine.

Prevention relies on safe water, sanitation, food safety and outbreak control.

Hepatitis E is an important cause of water-borne outbreaks of acute hepatitis, with high risk of severe disease in pregnancy.

HEV is a waterborne outbreak threat with special pregnancy risk

20 million

estimated infections each
year

3.3 million

symptomatic infections

≈50%

of reported outbreaks occur in
camp settings

Pregnancy—especially later pregnancy in genotype 1/2 outbreaks—carries increased risk of acute liver failure, fetal loss and death.

HEV vaccine policy changed after outbreak experience

What is established

Recombinant HEV vaccine is licensed in China and other countries
It has been used in outbreak response
Routine global use remains limited

2024 WHO/SAGE direction

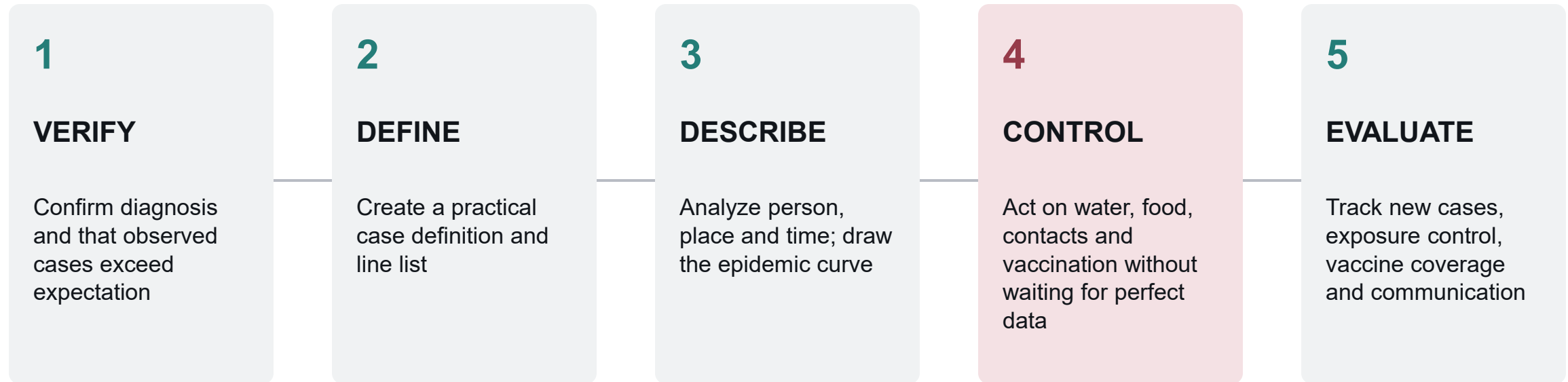
In fragile settings with documented circulation and severe pregnancy risk, benefits may outweigh potential harms
A 2-dose 0- and 1-month campaign schedule was accepted
Pregnancy safety evidence requires continued monitoring

Community Medicine decision: document transmission, define the high-risk population, combine vaccination with WASH, and monitor safety and impact.

HAV and HEV look similar clinically—but not epidemiologically

Feature	HAV	HEV
Typical reservoir/transmission	Humans; faecal–oral	Waterborne genotypes 1/2; zoonotic foodborne genotypes 3/4
Chronic infection	No	Rare; mainly immunosuppressed people
Highest-risk outcome	Older age/chronic liver disease	Pregnancy in outbreaks; immunosuppression
Vaccine access	Widely available	Limited; outbreak use expanding
Core community control	WASH, food safety, vaccine/PEP	WASH, safe water, targeted outbreak vaccination

Investigate enteric hepatitis outbreaks systematically



Control measures and investigation proceed in parallel.