

Towards a Hepatitis-Free Future: Prevention, Early Detection and Elimination

Theme : Prevention and Public Health

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Abstract

Viral hepatitis remains a major global public health concern, causing more than one million deaths annually despite the availability of effective preventive and therapeutic measures [1]. Hepatitis B virus (HBV) and hepatitis C virus (HCV) account for the majority of hepatitis-related mortality due to delayed diagnosis, inadequate vaccination coverage, and limited access to treatment. The World Health Organization (WHO) has set a goal to eliminate viral hepatitis as a public health threat by 2030; however, current progress remains insufficient to achieve these targets [2].

This review highlights key strategies for hepatitis prevention, including vaccination, harm-reduction approaches, early diagnosis, and timely treatment. It also examines successful elimination programmes in Egypt and Mongolia, demonstrating the importance of political commitment, population-based screening, affordable therapy, and strengthened healthcare systems [17,26].

Achieving hepatitis elimination requires effective implementation of existing tools, improved access to healthcare, and sustained public health efforts worldwide.

Keywords: Viral hepatitis; Hepatitis B; Hepatitis C; Prevention; Screening; Elimination

Introduction

Viral hepatitis remains a major global health challenge and continues to contribute significantly to morbidity and mortality worldwide. Among the different hepatitis viruses, hepatitis B virus (HBV) and hepatitis C virus (HCV) are responsible for the majority of chronic infections, leading to severe complications such as cirrhosis, liver failure, and hepatocellular carcinoma. According to the World Health Organization (WHO), viral hepatitis caused approximately 1.34 million deaths globally in 2024, with millions of new HBV and HCV infections occurring each year [1].

In 2016, the WHO introduced a global strategy to eliminate viral hepatitis as a public health threat by 2030, aiming to reduce new infections by 90% and hepatitis-related deaths by 65% compared with 2015 levels [2]. Despite the availability of effective hepatitis B vaccination, highly sensitive diagnostic methods, and curative therapies for hepatitis C, global progress remains inadequate due to limited screening, poor treatment coverage, and unequal access to healthcare services [1,2].

A major challenge in hepatitis control is the silent nature of chronic infection. Many individuals remain undiagnosed for years, allowing progressive liver damage to occur before symptoms appear. Therefore, strengthening prevention strategies, expanding early detection, and ensuring timely treatment are essential components of elimination efforts.

This review discusses current approaches for preventing viral hepatitis, improving diagnosis, and achieving elimination. It also highlights successful national programmes, particularly in Egypt and Mongolia, to identify key strategies that can guide global hepatitis elimination efforts.

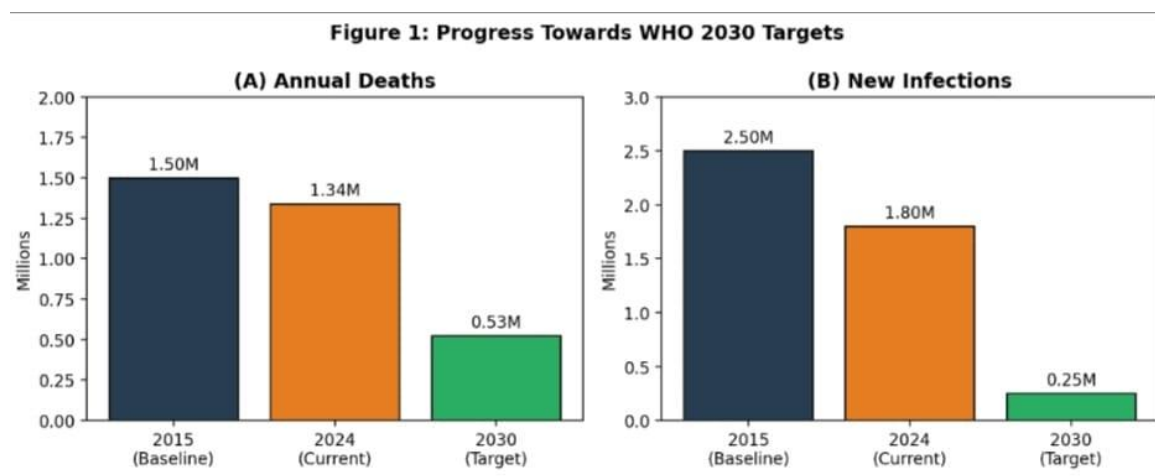


Figure 1: deaths and new infections have declined since 2015, but not sufficiently to achieve 2030 targets. Data source; WHO global hepatitis report 2026

Prevention: The First Line of Defense

1. Vaccination

Vaccination remains the most effective strategy for preventing hepatitis B virus (HBV) infection and reducing its long-term complications. The hepatitis B vaccine is safe, highly effective, and has been included in national immunization programmes in many countries for several decades. The World Health Organization (WHO) recommends universal infant vaccination, with the first (birth-dose) vaccine administered within 24 hours of birth to prevent mother-to-child transmission [6]. Timely administration of the birth dose, followed by completion of the vaccine series, has significantly reduced the prevalence of chronic HBV infection among children in many regions worldwide [1,6].

Despite these achievements, challenges remain. Infants born to mothers with high HBV viral loads may still acquire infection even after receiving appropriate vaccination. Studies have shown that maternal antiviral therapy with tenofovir during the third trimester of pregnancy, combined with neonatal vaccination and hepatitis B immunoglobulin for high-risk infants, further reduces the risk of vertical transmission [4,7,10]. This integrated approach is now considered the standard of care for preventing perinatal HBV infection in high-risk pregnancies.

Unlike hepatitis B, no licensed vaccine is currently available for hepatitis C virus (HCV). Consequently, prevention of HCV relies primarily on reducing exposure to infected blood. People who inject drugs represent one of the populations at greatest risk and contribute substantially to ongoing transmission [1,3]. Harm-reduction strategies, including needle and syringe programmes and opioid substitution therapy, have consistently been shown to reduce HCV transmission and are recommended as key public health interventions [12]. However, global implementation remains inadequate, with coverage falling well below WHO targets [1].

In addition to vaccination and harm-reduction measures, ensuring the safety of blood transfusions, promoting infection prevention and control practices in healthcare settings, and maintaining safe injection practices are essential components of comprehensive hepatitis prevention programmes.

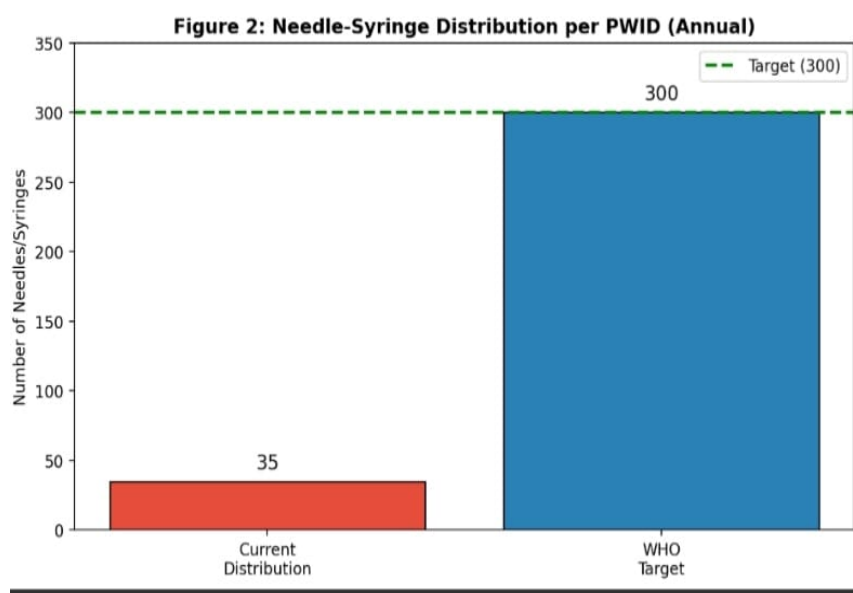


Figure 2: Needle – syringe distribution falls for short of levels required to interrupt HCV transmission among PWID(WHO,2026 ; platt et al., 2017)

2.Structural and Behavioural Prevention

Effective hepatitis prevention extends beyond medical interventions and requires strong public health systems and community engagement. Historical experience demonstrates the serious consequences of unsafe healthcare practices. In Egypt, widespread reuse of inadequately sterilized syringes during mass antischistosomal treatment campaigns contributed to one of the world's largest hepatitis C epidemics [21,24]. This experience highlights the importance of strict infection-control measures, safe medical procedures, and effective blood screening services.

Behavioural and social factors also influence hepatitis transmission. Stigma, discrimination, and poor public awareness often discourage individuals from seeking testing or treatment, particularly among vulnerable populations. Public education campaigns that promote knowledge about hepatitis transmission, vaccination, and the benefits of early diagnosis can improve health-seeking behaviour and increase community participation in screening programmes. Community-based interventions targeting high-risk groups, including people who inject drugs and individuals living with HIV, are particularly important for reducing transmission and improving access to care [9,12].

A comprehensive prevention strategy therefore requires integration of vaccination, infection-control measures, harm-reduction services, health education, and equitable access to preventive healthcare. Strengthening these interventions is essential for reducing the global burden of viral hepatitis and achieving the WHO elimination targets by 2030 [1,2]

Early Detection: Closing the Diagnostic Gap

Early diagnosis is a critical component of viral hepatitis elimination strategies because chronic hepatitis B virus (HBV) and hepatitis C virus (HCV) infections frequently remain asymptomatic for many years. Individuals may unknowingly carry the virus while progressive liver injury develops, eventually leading to complications such as cirrhosis and hepatocellular carcinoma. Therefore, identifying infected individuals before advanced disease occurs is essential for preventing transmission, initiating treatment, and reducing hepatitis-related mortality [1,3].

1.Expansion of Diagnostic Services

Traditional hepatitis testing approaches often involve multiple steps, including initial screening, confirmatory testing, referral to specialists, and initiation of treatment. These complex pathways can result in significant loss

of patients during the diagnostic process. Recent advances in point-of-care testing have helped overcome these barriers by enabling faster diagnosis and improving linkage to care.

Molecular point-of-care tests capable of detecting HCV RNA allow diagnosis and treatment decisions to be made during the same healthcare visit. This approach reduces delays between testing and treatment initiation and is particularly valuable in underserved populations where access to specialist care may be limited [8]. Simplifying diagnostic pathways through rapid testing and integrated services is therefore an important strategy for improving treatment coverage.

2.Integration with Existing Healthcare Services

One of the most effective approaches to increasing hepatitis detection is integrating screening into existing healthcare platforms. Antenatal clinics, HIV testing programmes, harm-reduction services, and correctional facilities already provide access to populations at increased risk and can serve as effective locations for hepatitis screening

A systematic review and meta-analysis evaluating decentralized models of hepatitis C testing and treatment demonstrated that integrated, community-based approaches significantly improved linkage to care compared with conventional referral-based systems. Among people who inject drugs, treatment initiation was higher in decentralized models compared with standard approaches, while similar improvements were observed in prison settings [9]. These findings highlight the importance of bringing hepatitis services closer to affected communities rather than relying solely on hospital-based care.

3.Population-Based Screening Approaches

Large-scale screening campaigns have demonstrated that active case finding can substantially accelerate hepatitis elimination. Egypt provides one of the most successful examples of nationwide HCV screening. Through a government-led programme, approximately 49.6 million individuals were screened within seven months, identifying millions of people with active infection who were subsequently offered treatment [17]. In addition, school-based screening programmes successfully identified infected adolescents and achieved very high cure rates following antiviral therapy [20].

Another important innovation is reflex testing, in which confirmatory viral load testing is automatically performed after a positive antibody result using the same blood sample. This reduces patient loss between diagnosis and confirmation, thereby improving treatment initiation rates [8].

4.Importance of Early Treatment

Early detection provides significant clinical and economic benefits. For hepatitis C, direct-acting antiviral therapies can achieve cure rates exceeding 95% with short treatment durations, often requiring only 8–12 weeks of therapy [1,3]. Early identification of HBV infection allows patients to receive appropriate monitoring and antiviral treatment when indicated, reducing the risk of cirrhosis and liver cancer.

From a public health perspective, expanding diagnosis and treatment reduces the reservoir of infection within communities and contributes directly to elimination efforts. Therefore, improving access to affordable, simplified, and decentralized testing services remains essential for achieving the WHO goal of eliminating viral hepatitis as a public health threat by 2030 [1,2].

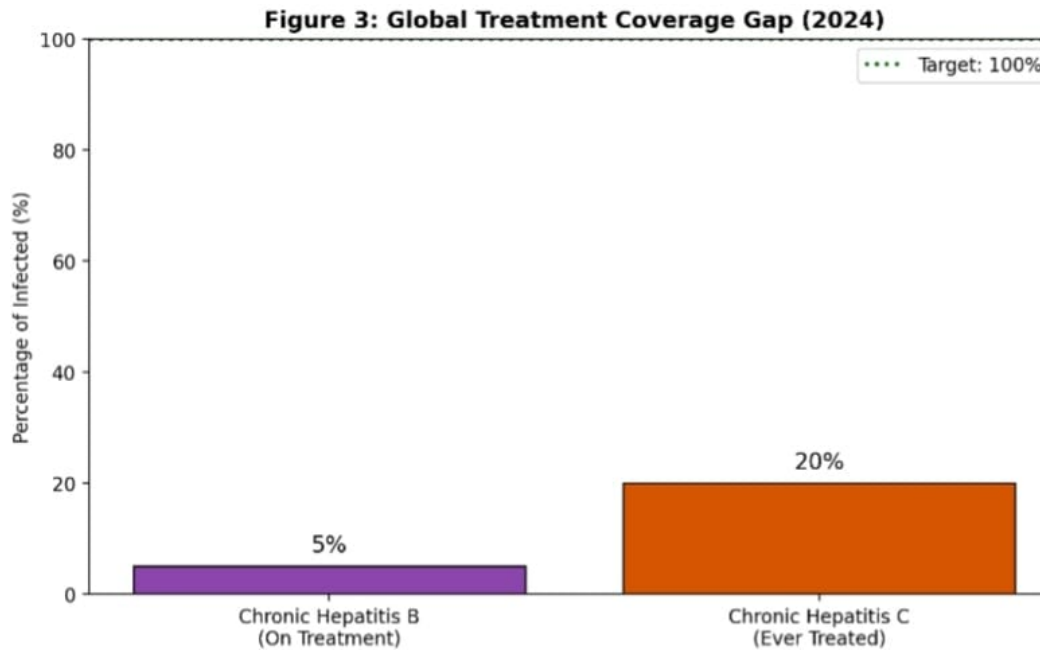


Figure 3 : Despite available vaccines and curative therapies, most individuals with chronic hepatitis B and C remain untreated (WHO,2026a; WHO,2026b)

Lessons from National Elimination Programmes

The global elimination of viral hepatitis requires more than the availability of effective vaccines and antiviral therapies; it depends on the successful implementation of these tools through strong healthcare systems and sustained political commitment. Experiences from countries such as Egypt and Mongolia demonstrate that elimination of hepatitis is achievable when prevention, diagnosis, and treatment strategies are delivered at a population level.

Egypt: A Model for Hepatitis C Elimination

Egypt represents one of the most successful examples of a national hepatitis C elimination programme. For decades, the country experienced one of the highest burdens of hepatitis C infection worldwide, largely due to historical transmission associated with mass antischistosomal treatment campaigns that used inadequately sterilized injection equipment during the mid-20th century [21,24]. By 2008, approximately 10% of Egyptians aged 15–59 years were estimated to have chronic HCV infection, creating a major public health challenge [22].

To address this burden, Egypt launched a comprehensive national strategy focused on large-scale screening, universal access to direct-acting antiviral (DAA) therapy, and strengthening healthcare infrastructure. In 2018, the government initiated one of the largest hepatitis C screening campaigns globally, aiming to identify and treat infected individuals across the country. Within seven months, nearly 49.6 million people were screened, and more than two million individuals were identified as infected and linked to treatment services [17].

The success of Egypt's programme was supported by several key factors, including strong government leadership, reduced costs of antiviral medications through negotiations and generic production, decentralized treatment services, and continuous monitoring of programme outcomes [17,18]. By 2023, Egypt achieved the World Health Organization's "gold tier" status on the pathway toward hepatitis C elimination, having diagnosed a large majority of infected individuals and successfully treated most diagnosed cases [19].

Egypt's experience demonstrates that even countries with a historically high disease burden can rapidly transform hepatitis control when screening and treatment are implemented through coordinated national strategies. The country's approach provides an important model for other high-burden regions seeking to accelerate elimination efforts.

Mongolia: Addressing Hepatitis in a High-Burden Setting

Mongolia provides another important example of a successful national response to viral hepatitis. The country has one of the highest rates of liver cancer globally, with chronic HBV and HCV infections contributing significantly to disease burden [26]. Recognizing the urgent need for action, Mongolia launched the “Healthy Liver Programme” in 2017 with support from international partners, aiming to expand nationwide screening, improve diagnosis, and provide treatment to individuals with viral hepatitis [26,27].

The programme focused on population-based screening and improving access to antiviral therapies, particularly in remote and underserved areas. Community-based initiatives demonstrated remarkable achievements, including high rates of diagnosis and treatment coverage in several provinces. For example, the Liver Disease Free Arkhangai project achieved diagnosis rates of approximately 98% and treatment rates of 96% among identified patients [25].

Economic evaluations of Mongolia’s hepatitis control programme further demonstrated that large-scale treatment of hepatitis C can be cost-saving by preventing future expenses associated with advanced liver disease, including cirrhosis and liver cancer [28]. These findings highlight that investment in elimination programmes is not only a public health priority but also an economically beneficial strategy.

Common Lessons from Successful Programmes

Although Egypt and Mongolia differ in healthcare infrastructure and epidemiological patterns, their successes share several common elements. These include strong political commitment, government-supported treatment programmes, widespread screening, affordable access to antiviral medications, and the integration of hepatitis services into primary healthcare systems.

Both countries demonstrate that hepatitis elimination is not dependent solely on advanced medical technology or high-income healthcare systems. Instead, success relies on effective implementation, sustainable financing, and ensuring that prevention, diagnosis, and treatment services reach the populations most in need [17,19,26,28].

Toward Elimination: Structural and Policy Priorities

Achieving the global goal of eliminating viral hepatitis as a public health threat by 2030 requires coordinated action at national and international levels. Although effective vaccines, diagnostic tools, and antiviral therapies are available, significant gaps remain in implementation. Closing these gaps will require stronger health policies, sustainable investment, and equitable access to prevention and treatment services.

1.Increasing Political Commitment and Investment

Historically, viral hepatitis has received less global attention and financial support compared with other major infectious diseases such as HIV and tuberculosis, despite causing a comparable number of deaths worldwide. Limited funding has restricted the expansion of vaccination programmes, diagnostic services, and treatment availability in many high-burden countries [1,2,29].

Greater political commitment is essential to ensure that hepatitis elimination becomes a public health priority. Governments must establish dedicated national strategies, allocate sustainable funding, and strengthen partnerships between healthcare systems, communities, and international organizations.

2.Decentralisation of Hepatitis Care

A major barrier to hepatitis elimination is the dependence on specialist-based healthcare models, which often limit access for people living in rural and underserved areas. Decentralising hepatitis services by integrating screening and treatment into primary healthcare settings can improve accessibility and increase treatment coverage.

Task-sharing approaches, where trained primary healthcare workers and community health providers deliver hepatitis-related services, have demonstrated effectiveness in expanding care beyond traditional hospital settings

[9]. Egypt and Mongolia successfully applied similar strategies by bringing screening and treatment services closer to communities, allowing greater numbers of individuals to receive timely care [17,26].

3.Improving Access to Affordable Treatment

The high cost of antiviral therapy has historically limited treatment availability, particularly in low- and middle-income countries. The introduction of generic direct-acting antivirals and mechanisms such as pooled procurement have significantly reduced treatment costs and enabled large-scale hepatitis C treatment programmes [17,20].

Expanding access to affordable medicines remains essential for achieving elimination targets. Governments and global health organizations must continue supporting policies that promote affordable drug availability while maintaining quality and safety standards.

4.Expanding Active Screening Strategies

Because chronic hepatitis infections often remain silent, relying only on symptom-based diagnosis is insufficient. Active screening strategies targeting high-risk populations and communities with high disease prevalence are necessary to identify undiagnosed infections.

National screening campaigns, community-based testing, and integration of hepatitis screening into existing healthcare services can rapidly improve case detection. The experiences of Egypt and Mongolia demonstrate that large-scale screening combined with immediate treatment access can significantly accelerate progress toward elimination [17,26].

5.Addressing Stigma and Improving Community Engagement

Stigma and misinformation remain important barriers to hepatitis prevention and treatment. Fear of discrimination may prevent individuals from seeking testing or accessing healthcare services, particularly among vulnerable populations such as people who inject drugs and individuals living with HIV.

Community-based organizations play an important role in increasing awareness, improving trust in healthcare systems, and connecting marginalized populations with essential services. Reducing stigma through education and public awareness campaigns is therefore a key component of successful elimination strategies [9,12].

Conclusion

Viral hepatitis remains a major global health challenge; however, elimination is achievable using existing scientific and public health tools. Effective hepatitis B vaccination, safe healthcare practices, harm-reduction strategies, reliable diagnostics, and highly effective antiviral treatments provide the foundation for disease control and eventual elimination.

The experiences of Egypt and Mongolia demonstrate that progress depends not only on medical advances but also on strong political leadership, sustainable financing, accessible healthcare delivery, and commitment to reaching underserved populations. The current gap between available interventions and their implementation represents the greatest challenge to achieving the WHO 2030 elimination targets.

A hepatitis-free future does not require new scientific discoveries; rather, it requires effective application of existing solutions on a global scale. Strengthening prevention, expanding early detection, and ensuring universal access to treatment will be essential steps toward eliminating viral hepatitis as a public health threat

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