OPEN ACCESS Freely available online

ISSN: 2576-389X
Journal of Infectious Diseases and Diagnosis

Perspective

Bridging Clinical Assessment and Laboratory Testing for Improved Hepatitis Diagnosis

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DESCRIPTION

Hepatitis, characterized by inflammation of the liver, represents a major global health challenge with diverse etiologies, including viral infections, alcohol, drugs and autoimmune disorders. Viral hepatitis, caused primarily by hepatitis A, B, C, D and E Viruses (HAV, HBV, HCV, HDV and HEV), is the most common and clinically significant form due to its potential for acute and chronic liver disease, cirrhosis and hepatocellular carcinoma. Accurate and timely diagnosis is important for effective treatment, prevention of transmission and monitoring of disease progression, particularly in high-risk populations such as healthcare workers, people who inject drugs and individuals living with HIV. Modern diagnostic approaches combine clinical evaluation, serologic testing, molecular assays and imaging techniques to provide precise identification and staging of infection.

Clinical diagnosis of hepatitis is challenging due to the nonspecific nature of early symptoms, which may include fatigue, anorexia, nausea, vomiting, right upper quadrant abdominal discomfort, jaundice and dark urine. Some patients, particularly in chronic Hepatitis B or C, may remain asymptomatic for years while sustaining ongoing liver injury. Therefore, laboratory confirmation is essential for accurate diagnosis and for guiding treatment and public health interventions.

Serologic testing is the primary tool for diagnosing viral hepatitis and differentiating among its types. In hepatitis A and E, detection of anti-HAV IgM or anti-HEV IgM antibodies indicates acute infection, while IgG antibodies reflect prior exposure or immunity. Hepatitis B diagnosis relies on detection of Hepatitis B Surface Antigen (HBsAg), Hepatitis B Core Antibody (anti-HBc) and Hepatitis B Surface Antibody (anti-HBs), which together allow determination of acute, chronic, or resolved infection status. Hepatitis D infection requires testing for anti-HDV antibodies in the context of HBV infection. Hepatitis C is diagnosed primarily through detection of anti-HCV antibodies, with molecular assays confirming active infection by detecting HCV RNA.

Molecular diagnostic methods, including Polymerase Chain Reaction (PCR) and real-time PCR, have revolutionized hepatitis diagnosis by enabling direct detection and quantification of viral nucleic acids. These techniques provide highly sensitive and specific confirmation of active infection, assessment of viral load and monitoring of therapeutic response. Quantitative viral load measurements are particularly important in hepatitis B and C to guide treatment decisions, predict disease progression and evaluate antiviral efficacy. Genotyping assays further refine clinical management by identifying viral subtypes that influence treatment choice and prognosis.

Liver function tests, including measurements of Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), bilirubin, alkaline phosphatase and gamma-glutamyl transferase, provide supportive evidence of hepatic injury but are nonspecific for viral etiology. Persistent elevations in liver enzymes may indicate ongoing inflammation, necessitating further evaluation through serologic and molecular testing. Imaging modalities, such as ultrasound, elastography and magnetic resonance imaging, assist in assessing liver fibrosis, cirrhosis, or hepatocellular carcinoma, complementing laboratory-based diagnosis.

Emerging diagnostic approaches include point-of-care tests for rapid detection of hepatitis antigens or antibodies, enabling timely screening in resource-limited settings and improving linkage to care. Multiplex platforms capable of detecting multiple hepatitis viruses simultaneously, as well as co-infections with HIV or other pathogens, have enhanced diagnostic efficiency and epidemiologic surveillance. Advances in next-generation sequencing allow detailed characterization of viral genomes, identification of resistance mutations and monitoring of viral evolution in chronic infection.

Integration of clinical assessment with laboratory and molecular diagnostics ensures accurate identification, staging and

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Received: 29-Oct-2025, Manuscript No. JIDD-25-30661; **Editor assigned:** 03-Nov-2025, PreQC No. JIDD-25-30661 (PQ); **Reviewed:** 17-Nov-2025, QC No. JIDD-25-30661; **Revised:** 24-Nov-2025, Manuscript No. JIDD-25-30661 (R); **Published:** 03-Dec-2025, DOI: 10.35248/2576-389X.25.10.365

Citation: Hazber R (2025). Bridging Clinical Assessment and Laboratory Testing for Improved Hepatitis Diagnosis. J Infect Dis Diagn. 10:365.

management of hepatitis. Early detection through routine screening, particularly in high-risk populations, is important for initiating antiviral therapy, preventing progression to cirrhosis or hepatocellular carcinoma and reducing transmission. Accurate diagnosis also informs public health strategies, including vaccination, outbreak control and population-level surveillance.

In conclusion, effective diagnosis of hepatitis relies on a combination of serologic testing, molecular assays, liver function evaluation and clinical assessment. Advances in molecular techniques, rapid testing and genomic analysis have significantly improved the sensitivity, specificity and speed of diagnosis. Continued innovation and integration of these diagnostic tools are essential for optimizing patient outcomes, guiding treatment and supporting global efforts to control and eliminate viral hepatitis as a major public health threat.