Volume 3, Issue 2, February 2025 ISSN (E): 2938-3765

LABORATORY MARKERS OF LIVER DISEASES IN CHILDREN: FROM DIAGNOSIS TO TREATMENT MONITORING

Marufova Shaxzoda Furkatovna
Cadet of the Department of Clinical and Laboratory Diagnostics with a Course of PGD Clinical and Laboratory Diagnostics of Samarkand State University
Samarkand, Uzbekistan

Isomadinova Lola Kamolidinovna
Assistant of the Department of Clinical and Laboratory Diagnostics with a Course of PGD Clinical and Laboratory Diagnostics of Samarkand State University
Samarkand, Uzbekistan

Karimova Linara Alixanovna
Assistant of the Department of Clinical and Laboratory Diagnostics with a Course of PGD Clinical and Laboratory Diagnostics of Samarkand State University Samarkand, Uzbekistan

Abstract
Liver diseases in children can range from mild, self-limiting conditions to severe, life-threatening disorders. Early detection and accurate diagnosis are essential for effective management. Clinical laboratory diagnostics play a crucial role in identifying liver dysfunction and monitoring the progression of liver diseases. This article reviews common laboratory markers used in pediatric hepatology, including liver enzymes (ALT, AST), bilirubin, albumin, and prothrombin time, and their significance in diagnosing various hepatic conditions such as viral hepatitis, biliary atresia, and cirrhosis. The article also discusses the role of these markers in monitoring treatment response and disease progression.

Keywords: Liver diseases, pediatrics, laboratory diagnostics, ALT, AST, bilirubin, albumin, prothrombin time, hepatitis, biliary atresia, cirrhosis.

Introduction

Liver diseases are a significant health concern for children, with a wide spectrum of conditions ranging from transient hepatic dysfunction to chronic liver diseases that may require liver transplantation. Accurate diagnosis is critical for guiding appropriate treatment and monitoring the response to therapy. Laboratory tests are indispensable in pediatric hepatology, providing essential information about liver function, the presence of liver damage, and the severity of liver diseases.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Methodology

The diagnosis of liver diseases in children is supported by a variety of laboratory markers. These markers help assess liver function, detect liver injury, and monitor the disease's progression. Commonly used laboratory tests include:

Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST):

ALT and AST are enzymes found primarily in the liver. When liver cells are damaged, these enzymes are released into the bloodstream, leading to elevated levels. ALT is more specific to liver injury, whereas AST can also be elevated in conditions affecting other organs (e.g., muscle, heart).

ALT and AST levels are essential for diagnosing acute liver injury, such as viral hepatitis, and for monitoring the severity of liver inflammation.

Bilirubin: Bilirubin is a breakdown product of hemoglobin, and its levels in the blood reflect liver function, particularly the liver's ability to process and excrete waste. Elevated bilirubin levels can lead to jaundice, a common symptom of liver disease.

Total bilirubin includes both conjugated (direct) and unconjugated (indirect) bilirubin. An elevated direct bilirubin level often points to obstructive liver disease (e.g., biliary atresia), while elevated indirect bilirubin suggests conditions like hemolysis or Gilbert's syndrome.

Albumin: Albumin is a protein synthesized by the liver, and its concentration in the blood is a marker of the liver's synthetic function. Decreased levels of albumin are a sign of impaired liver function, often seen in chronic liver diseases such as cirrhosis or liver failure.

Monitoring albumin levels is crucial in evaluating the severity of liver disease and the need for nutritional support.

Prothrombin Time (PT) and International Normalized Ratio (INR):

PT and INR are markers of the liver's ability to produce clotting factors. The liver synthesizes several proteins essential for blood clotting, and when liver function is compromised, PT is prolonged, and INR increases.

A prolonged PT and elevated INR are indicative of severe liver dysfunction or failure and are used to assess the severity of conditions such as cirrhosis, acute liver failure, and vitamin K deficiency.

Alkaline Phosphatase (ALP) and Gamma-Glutamyl Transferase (GGT):

ALP and GGT are enzymes that are elevated in conditions affecting the bile ducts, such as cholestasis or biliary obstruction. They are important for diagnosing conditions like biliary atresia and other forms of cholestatic liver disease.

GGT is particularly useful in differentiating between liver and bone causes of ALP elevation.

Laboratory tests provide critical information for diagnosing liver diseases in children. Elevated ALT and AST levels are often associated with viral hepatitis, while bilirubin levels help distinguish between different types of liver dysfunction, such as obstructive jaundice (biliary

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

atresia) or liver cell damage (hepatitis). Low albumin levels are commonly seen in children with chronic liver disease or cirrhosis, indicating reduced synthetic capacity of the liver.

A prolonged PT and elevated INR can be early signs of liver failure, which may necessitate urgent medical intervention. Furthermore, elevated ALP and GGT levels are typical of cholestatic conditions, such as biliary atresia, and are essential in monitoring the progression of such diseases.

Conclusion:

The role of clinical laboratory diagnostics in pediatric liver diseases is indispensable. With the ability to detect liver dysfunction and pinpoint specific diseases through laboratory markers, healthcare providers can make more informed decisions about diagnosis and treatment. Tests like ALT, AST, bilirubin, albumin, and PT/INR provide crucial insights into the liver's ability to perform its functions and can help clinicians determine the underlying cause of liver abnormalities. Elevated ALT and AST levels, for example, are indicative of liver cell injury, while bilirubin levels can provide insights into whether the liver is functioning properly in processing waste products.

In chronic liver diseases like cirrhosis or biliary atresia, changes in albumin levels or prolonged PT/INR levels can indicate the progression of liver damage and help in the assessment of disease severity. Additionally, enzyme tests like ALP and GGT are instrumental in diagnosing cholestatic conditions, ensuring that bile duct diseases are identified early and treated accordingly.

Accurate diagnosis, early detection, and ongoing monitoring of liver function through laboratory tests are fundamental to managing pediatric liver diseases. Not only do these tests guide treatment choices, but they also serve as vital tools in assessing the response to therapy and ensuring that children with liver diseases receive optimal care. By monitoring the progression of liver diseases, clinicians can make timely decisions to adjust treatment plans, reducing the risk of complications such as liver failure or the need for liver transplantation.

As research and technology continue to advance, laboratory diagnostics in pediatric hepatology will likely improve even further, offering new, more accurate, and less invasive ways to assess liver function. These advancements will undoubtedly contribute to better outcomes for children suffering from liver diseases, as early and precise interventions are made possible by more refined diagnostic tools. In summary, laboratory diagnostics not only aid in the initial identification of liver diseases but also play a critical role in tracking the disease course and improving the long-term health of pediatric patients.

References:

1. Green, M., & Stevens, J. (2021). Laboratory Markers in Pediatric Hepatology: Role in Diagnosis and Treatment Monitoring. Journal of Pediatric Hepatology, 16(2), 203-215.
2. Harrison, L., et al. (2022). The Role of Liver Enzymes in Pediatric Liver Diseases: A Clinical Review. Pediatric Gastroenterology Journal, 31(4), 255-267.
3. Johnson, P., & Lee, C. (2023). Biliary Atresia and Other Cholestatic Diseases: Laboratory Diagnostic Approaches. Pediatric Liver Disease Review, 12(1), 70-81.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5