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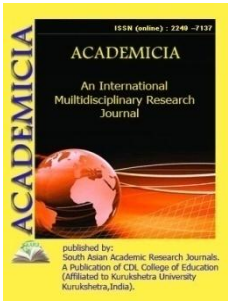

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AN OVERVIEW ON LIVER FUNCTION TEST

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ABSTRACT

Laboratory liver tests are diagnostic and therapeutic tests used to evaluate and treat individuals with hepatic dysfunction. The liver is in charge of glucose, protein, and fat metabolism. Some enzymes and end products of the metabolic pathway that are very sensitive to abnormalities may be used as biochemical markers of liver malfunction. Serum bilirubin, alanine amino transferase, aspartate amino transferase, ratio of aminotransferases, alkaline phosphatase, gamma glutamyl transferase, 5' nucleotidase, ceruloplasmin, and -fetoprotein are some of the biochemical indicators discussed in this article. Clinical diagnosis of illness involving the liver or other organs may be complicated by a single or conjugated change of biochemical indicators of liver damage in patients. The term "liver chemistry tests" is a loosely defined word that refers to a variety of serum chemistries that may be used to evaluate hepatic function and/or damage.

KEYWORDS: *Alanine Amino Transferase, Alkaline Phosphatase, Bilirubin, Gamma glutamyl transferase, 5' nucleotidase.*

1. INTRODUCTION

Serum Bilirubin:

Bilirubin is a catabolic product of haemoglobin generated inside the reticuloendothelial system. It is released in an unconjugated form that enters the liver and is transformed by the enzyme UDP-glucuronyltransferase to conjugated forms bilirubin mono and diglucuronides. The normal range for total bilirubin in the blood is 2 to 21 mol/L. Bilirubin levels are fewer than 12 mol/L

for indirect (unconjugated) bilirubin and less than 8 mol/L for direct (conjugated) bilirubin. Serum bilirubin levels more than 17 mol/L indicate liver illness, whereas values greater than 24 mol/L indicate abnormal liver testing in the lab. At a blood concentration of approximately 40 mol/L, bilirubin becomes visible inside the sclera, skin, and mucous membranes, causing jaundice. Unconjugated hyperbilirubinemia is caused by excessive bilirubin synthesis, poor hepatic absorption or conjugation, or both. Gilbert's disease, Crigler-Najjar syndrome, reabsorption of massive hematomas, and inefficient erythropoiesis are all caused by a hereditary deficiency of UDP-glucuronyltransferase. Higher levels of serum conjugated bilirubin are observed in viral hepatitis, hepatocellular damage, toxic or ischemic liver injury. In acute viral hepatitis, hyperbilirubinemia is related to the degree of hepatocyte histological damage and the length of time the illness lasts[1]–[3].

Alanine amino transferase (ALT):

When compared to other bodily tissues, ALT is present in the kidney, heart, and muscle, with a higher concentration in the liver. The transamination process is catalyzed only by ALT in the cytoplasm. The normal range for ALT in the blood is 7-56 U/L. Any kind of liver cell damage may cause ALT levels to rise. Nonspecific levels of up to 300 U/L are considered high. People with illnesses that target mainly hepatocytes, such as viral hepatitis, ischemia liver injury (shock liver), and toxin-induced liver damage, have significant increases of ALT levels higher than 500 U/L. Despite the fact that there is a link between high ALT levels and hepatocellular disorders, the absolute peak of ALT elevation does not correspond to the degree of liver cell damage. A significant rise in aminotransferase levels may be caused by viral hepatitis A, B, C, D, and E.

Aspartate amino transferase (AST):

The transamination process is catalyzed by the AST enzyme. There are two genetically distinct isoenzyme forms of AST: mitochondrial and cytoplasmic versions. When compared to other bodily tissues such as the liver, skeletal muscle, and kidney, the heart has the greatest concentration of AST. The normal range for serum AST is 0 to 35 U/L. Extensive tissue necrosis after myocardial infarction, as well as chronic liver disorders including liver tissue degeneration and necrosis, are associated with elevated mitochondrial AST. The mitochondrial isoenzyme contributes around 80% of AST activity in the liver, while the cytosolic isoenzyme is responsible for the majority of circulating AST activity in healthy individuals. The ratio of mitochondrial AST to total AST activity, on the other hand, is useful in detecting liver cell necrosis and alcoholic hepatitis. AST increases are common in individuals with cirrhosis and even in liver disorders when the ALT is usually elevated. AST values were 73U/L in hyperemesis gravidarum, 66U/L in pre-eclampsia, and 81U/L in hemolysis with low platelet count and high liver enzymes in symptomatic pregnant patients[4]–[7].

AST/ALT ratio:

Clinically, the ratio of AST to ALT is more useful than evaluating individual high values. A lack of the coenzyme pyridoxal-5'-phosphate may lower serum ALT activity, which raises the AST/ALT ratio. The ratio rises as the liver's function deteriorates, with 81.3 percent sensitivity and 55.3 percent specificity in detecting cirrhotic individuals. In alcoholic liver disease and post necrotic cirrhosis, the mean ratios were 1.45 and 1.3, respectively. With 87 percent sensitivity

and 52 percent specificity, a ratio higher than 1.17 was observed in one-year survival among patients with viral cirrhosis. Advanced liver fibrosis and chronic hepatitis C infection are indicated by a ratio higher than 1. However, alcoholic hepatitis is characterized by an AST/ALT ratio higher than 2. The AST/ALT ratio of 0.9 in NASH and 2.6 in individuals with alcoholic liver disease was used to distinguish nonalcoholic steatohepatitis (NASH) from alcoholic liver disease in a recent research. In individuals with NASH-related cirrhosis, a mean ratio of 1.4 was discovered. Wilson's illness may cause the ratio to surpass 4.5, and hyperthyroidism can also produce an altered ratio.

Alkaline phosphatase (ALP):

ALP is found in the small intestine mucosal epithelia, proximal convoluted tubule of the kidney, bone, liver, and placenta. In the gut, it transports lipids, and in the bone, it calcifies. The liver is responsible for the majority of serum ALP activity, with bone contributing 50%. The normal range for serum ALP is 41 to 133 U/L. ALP is typically normal or slightly elevated in acute viral hepatitis. Hepatitis A presenting cholestasis is linked to an increase in ALP with persistent itching. Tumors release ALP into the bloodstream, and isoenzymes including Regan, Nagao, and Kasahara are unique to tumors. ALP levels may also be increased as a result of hepatic and bone metastases. Other illnesses that induce an increase in ALP include infiltrative liver diseases, abscesses, granulomatous liver disease, and amyloidosis. Cirrhosis, hepatitis, and congestive heart failure may all cause somewhat increased ALP values. Hypothyroidism, pernicious anemia, zinc insufficiency, and congenital hypophosphatasia all cause low levels of ALP[8].

Gamma Glutamyl Transferase (GGT):

Hepatocytes and biliary epithelial cells, renal tubules, pancreas, and intestine all contain GGT, a microsomal enzyme. It is also found in the cell membrane, where it transports peptides into the cell and participates in glutathione metabolism. Even though it is present in higher quantity in renal tissue, serum GGT activity is mostly ascribed to the hepatobiliary system. GGT levels range from 9 to 85 U/L in the typical range. GGT levels peak in acute viral hepatitis in the second or third week of illness, and in some individuals, they stay high for up to six weeks. About 30% of individuals with chronic hepatitis C infection have an elevated level. GGT levels were also increased in patients with simple diabetes, acute pancreatitis, myocardial infarction, anorexia nervosa, Gullian barre syndrome, hyperthyroidism, obesity, and dystrophica myotonica. In alcoholism, serum GGT levels are elevated by more than 10 times. It's linked to structural liver damage, activation of hepatic microsomal enzymes, and alcoholic pancreatic injury. Because serum antioxidant carotenoids such as lycopene, -carotene, -carotene, and -cryptoxanthin are inversely related with alcohol-induced increases in serum GGT in moderate and heavy drinkers, GGT may be used as an early predictor of oxidative stress. In more than half of individuals with nonalcoholic fatty liver disease, GGT levels are 2–3 times higher than the upper reference range.

5' Nucleotidase (NTP):

NTP is a glycoprotein that is widely distributed throughout the body and is found in the cytoplasmic membrane, where it catalyzes the release of inorganic phosphate from nucleoside-5-phosphates. The recognized normal range is 0 to 15 U/L. Patients with obstructive jaundice,

parenchymal liver disease, hepatic metastases, and bone illness had higher levels of NTP activity. NTP is a specific marker for primary or secondary hepatic tumors in the early stages. ALP levels rose in conjunction with NTP, indicating intra- or extra-hepatic blockage caused by cancer. NTP levels are elevated in both acute infective hepatitis and chronic hepatitis. When compared to chronic hepatitis, acute hepatitis causes a greater increase in NTP activity, which is attributable to the shedding of plasma membranes with excessive NTP activity owing to cell destruction or the leaking of bile carrying high NTP activity. In the second and third trimesters of pregnancy, serum NTP activity was modestly but substantially increased.

Ceruloplasmin:

Ceruloplasmin is an acute phase protein that is produced in the liver. It binds to copper and acts as a primary copper transporter in the bloodstream. Ceruloplasmin levels in the blood range from 200 to 600 mg/L. Infections, rheumatoid arthritis, pregnancy, non-Wilson liver disease, and obstructive jaundice can raise the amount. Menke's illness, kwashiorkor, marasmus, protein-losing enteropathy, copper insufficiency, and aceruloplasminemia may all cause low levels. Ceruloplasmin levels are low in Wilson's illness. Because ATP7B is damaged, a decreased rate of ceruloplasmin synthesis is responsible for copper buildup in the liver due to a copper transport deficiency in the golgi apparatus. In chronic active liver disease (CALD), serum ceruloplasmin levels were higher, while in Wilson's disease, they were lower (WD). As a result, it is the most reliable standard chemical screening test for distinguishing CALD from WD.

α-fetoprotein (AFP):

The AFP gene is highly active in the foetal liver, although it is suppressed substantially soon after birth. The mechanisms that cause postpartum liver AFP transcriptional suppression are not well known. AFP is a significant serum protein generated at high quantities by the foetal liver and visceral endoderm of the yolk sac, and at low levels by the foetal gut and kidney in the growing mammalian foetus. AFP protects the developing female brain from estrogen exposure during embryonic development, which is necessary for female fertility. The conclusion that maturation stoppage of liver-determined tissue stem cells causes hepatocellular carcinomas was reached in response to liver damage and during the early phases of chemical hepatocarcinogenesis. AFP levels should be between 0 and 15 g/L. In individuals with cirrhosis, an AFP value of 400-500g/L has been deemed diagnostic for hepatocellular carcinoma (HCC). In HCC patients, a high AFP concentration of 400g/L is linked to larger tumors, bilobar involvement, portal vein invasion, and a poorer median survival rate.

When cut-off values of 10% to 15% are utilized, Lens culinaris-reactive AFP, also known as AFP-L3, is the predominant glycoform of AFP in the blood of HCC patients, and it may be identified in about one third of patients with minor HCC (3 cm). AFP-L3 is a measure for HCC clearance after therapy. It has been observed that an AFP-L3 level of 15% or above is linked to HCC-related portal vein invasion. The AFP-L3 / AFP ratio may be used to assist in HCC diagnosis and prognosis. The risk of sudden infant death syndrome (SIDS) is directly linked to maternal blood alpha-fetoprotein levels in the second trimester, which may be mediated in part by decreased foetal development and premature delivery.

2. LITERATURE REVIEW

P. Jamjute et al. discussed about Liver Function test and pregnancy[9]. The physiological alterations in liver function that occur during pregnancy are often transitory and very rarely permanent. Pre-eclampsia and eclampsia, acute fatty liver of pregnancy AFLP, haemolysis, high liver enzyme and low pletelets HELLP syndrome, cholestasis, hyperemisis gravidarum, and isolated instances of raised liver enzymes may all have severe consequences during pregnancy. Early interpretation of liver function tests (LFTs) may lead to prompt treatment and perhaps minimize problems in both the mother and the baby. Normal LFTs may not necessarily imply a healthy liver. The interpretation of basic blood LFTs may lead to a variety of problems. LFTs are often utilized to evaluate liver damage rather than hepatic function. Abnormal LFTs may suggest an issue with the liver and give clues to the nature of the disease, although this is not always the case. This overview discusses the different biochemical tests, their etiology, and a method for interpreting aberrant LFTs. Alanine transaminase, aspartate aminotransferase, alkaline phosphatase, bile salts, bilirubin levels, albumin, and prothrombin time are all common assays.

A. Blann discussed about purpose of Liver Function test[10]. The liver is the biggest single distinct organ in the body. It performs four main functions: metabolism and synthesis, excretion, storage, and possible toxin detoxification. Because of these many roles, a single test is insufficient to completely evaluate how the liver is working; at least five separate liver function tests are needed. Part 2 of a four-part series, this article cover the information that these tests may give on acute and chronic liver illness, as well as how disease impacts liver function.

3. DISCUSSION

A liver function test is one of many tests that look at the amounts of enzymes and other proteins in your blood. A hepatic panel, commonly known as a liver function test (LFT or LF), is a collection of blood tests that give information about the condition of a patient's liver. Prothrombin time (PT/INR), activated Partial Thromboplastin time (aPTT), albumin, bilirubin (direct and indirect), and others are among the assays available. In a patient with some degree of intact liver function, the liver transaminases aspartate based test (AST or SGOT) as well as alanine aminotransferase (ALT or SGPT) are helpful indicators of liver damage. The majority of liver disorders have minor side effects at first, but they must be identified early. Hepatic (liver) functioning in some illnesses may be critical. This test is done on a blood sample from a patient. Some tests are related to functioning (e.g., albumin), cellular integrity (e.g., transaminase), and biliary tract conditions.

4. CONCLUSION

Laboratory liver tests aid in determining the changes in indicators that indicate liver disease. The evaluation of enzyme abnormalities such as the prevailing sequence of enzyme modification, the amplitude of enzyme alteration in the case of aminotransferases, isolated elevation or in conjugation with another parameter, the rate of change and the nature of the course of alteration, or a follow-up period of 6 months to 1-2 years aids in disease diagnosis. However, since many severe liver illnesses are associated with normal levels, and abnormal levels may be detected in asymptomatic healthy people, a single laboratory liver test is of limited use in screening for liver

disease. The pattern of enzyme abnormalities, when evaluated in light of the patient's symptoms, may help guide the diagnosis.

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