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# Liver Function Tests in Psychiatry

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## Introduction

Liver Function Tests (LFTs) are important in psychiatry for various reasons. The liver metabolizes most of the medications we prescribe and so we need to ensure that liver functioning is adequate. In addition, excessive substance use can seriously damage the liver. This fact sheet provides an overview of the most relevant LFTs, including their normal ranges, interpretation, and clinical relevance in psychiatry.

## Standard LFT Panel

- **Alanine Transaminase (ALT) and Aspartate Transaminase (AST):** Elevated levels indicate liver inflammation from various causes. Normal ranges vary but are generally < 50 units per liter for ALT and <40 U/L for AST.
  - Mild elevation = up to 5 times the upper limit of normal (Eg., ALT and AST no higher than about 200).
    - Practice tip: Don't freak out when AST and ALT are double or triple normal levels—this means mild inflammation but not liver impairment. Such patients can usually take regular doses of all psychiatric drugs.
  - Moderate elevation = between 5 to 10 times the upper limit of normal
  - Marked elevation = more than 10 times the upper limit of normal
- **Alcoholic liver disease.** An AST:ALT ratio > 2 suggests alcoholic liver disease (Mnemonic: "S" is higher than "L" in the alphabet).
- **Nonalcoholic fatty liver disease.** Most common cause of mild liver enzyme elevation in absence of alcohol use, often related to obesity, diabetes, hypertension, and hyperlipidemia, all of which are often seen in our patients with psychiatric disorders.
  - Practice tip: Elevated liver enzymes don't necessarily mean your patient has a drinking problem.
- **Alcoholic cirrhosis:** AST and ALT may be abnormally low due to extensive scarring of hepatic cells.
- **Gamma-glutamyltransferase (GGT):** Normal range: 7-48 units per liter, range varies by gender.
  - Alcohol and elevated GGT
    - Gamma-glutamyltransferase (GGT) levels can rise due to excessive alcohol consumption, even when other liver enzymes like ALT and AST remain normal. This increase is because chronic alcohol use prompts the liver to produce more enzymes, including GGT, to metabolize and detoxify alcohol.
    - Elevated GGT serves as an early indicator of heavy alcohol intake, often before any liver damage is visible. Thus, high GGT levels with normal ALT and AST suggest significant alcohol use, making GGT a critical marker for assessing alcohol use disorder in patients without overt liver damage.
- **Alkaline Phosphatase (ALP):** Another enzyme related to liver and bone health. Normal range: 20-140 U/L.
  - Elevations may mean: (1) Cholestasis, any blockage in in ducts; (2) Pregnancy; (3) Various bone diseases including cancers
- **Bilirubin:** Bilirubin is a breakdown product of red blood cells, which have a lifespan of about 120 days. The liver creates bilirubin via enzymes, then adds it to bile for eventual excretion via the GI tract. Thus, the bilirubin level is a measure of the liver's ability to process waste.
  - Total bilirubin range: 0.1-1.2 mg/dL. It is composed of both direct and indirect bilirubin.
    - Indirect bilirubin is the form released from the breakdown of red blood cells, not yet processed by the liver.

- Direct bilirubin is bilirubin that has been conjugated to other molecules, rendering it water soluble and able to be excreted.
- Excessive bilirubin leads to jaundice (yellow skin and eyes) and can be caused by liver dysfunction, bile duct obstruction (“cholestatic jaundice”), or excessive breakdown of RBCs, as in hemolysis. The levels of indirect vs direct bilirubin will help specialists determine the pathology, but it’s not something psychiatrists need to learn.
- **Albumin:** Main protein made by the liver; a measure of nutrition and liver function. Normal range: 3.5-5.0 g/dL.
  - Albumin is an important transporter of various substances in the bloodstream (such as many medications). Since albumin has a long half life of about 20 days, low levels indicate chronic liver disease and malnutrition rather than acute liver injury.
- **Total Protein:** Includes albumin and all other blood proteins. Normal range: 6.3-7.9 g/dL.

#### Other labs relevant to liver function

- **Prothrombin time (PT):** Measures the time it takes for blood to clot (range 11-13.5 sec).
- **International Normalized Ratio (INR):** The INR is a standardized way of expressing PT, and is used primarily to monitor patients on the anticoagulant warfarin. Normal INR range is 0.8 to 1.1; target INR for those on warfarin, 2.0 to 3.0.
  - Both of these assess the liver’s ability to produce clotting factors.
- **Ammonia.** Normal range: 15 to 45  $\mu\text{mol/L}$ . The liver metabolizes ammonia, which is a toxic byproduct of protein metabolism. Elevated levels cause lethargy and confusion. Poor liver function may lead to high ammonia levels, though a more common cause of hyperammonemia in psychiatric patients is valproic acid (Depakote). Management includes stopping the offending agent and administering lactulose.
- **Viral hepatitis titers:** See separate Viral Hepatitis fact sheet for details.