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## Liver

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### Summary

- The main roles of the liver include removing toxins, processing food nutrients and regulating body metabolism.
  - Important causes of liver disorders are fatty liver, hepatitis virus infections and alcohol.
  - Cirrhosis (liver scarring), the end-result of many liver disorders, can lead to liver failure.
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The liver is on the upper right side of the abdomen, just below the diaphragm. It is the largest internal organ of the human body and weighs around 1.5kg in the average adult.

Blood from the digestive system must first filter through the liver before it travels anywhere else in the body.

The main roles of the liver include:

- removing toxins from the body
- processing food nutrients
- helping to regulate body metabolism.

Conditions that can prevent the liver from performing its vital functions include:

- fat accumulation
- alcohol misuse
- viral infection
- iron or copper accumulation
- toxic damage
- cancer.

The most common cause of liver disease is non-alcoholic fatty liver disease ('fatty liver'). Cirrhosis is the end-result of many liver conditions. It involves severe scarring of the liver (with liver nodule formation). Cirrhosis is associated with a progressive decline in liver function resulting in liver failure.

### Functions of the liver

Some of the many functions of the liver include:

- The liver converts carbohydrates into glucose for instantly available energy. It also converts glucose into its storable form (glycogen). When blood sugar levels drop, glycogen is converted back into glucose.
- Amino acids from protein are sent to the liver for the production of body proteins such as hormones.
- The liver produces important body proteins such as albumin.
- The liver is involved in the production of blood clotting factors.
- Bile, produced by the liver, is stored in the gall bladder and used to help break down dietary fats. (Fat soluble vitamins A, D, E and K need bile in order to be absorbed by the body.)
- Ammonia is a toxic by-product of protein metabolism. The liver changes ammonia into urea, which is then excreted in urine.
- Medication and drugs, including alcohol, are filtered through the liver. They are neutralised or converted into other forms by special enzymes.

### Symptoms of liver disease

Symptoms of liver disease depend on the disorder, but can include:

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- jaundice (the skin or whites of the eye turn yellow)
- dark urine
- nausea
- vomiting
- diarrhoea
- appetite loss
- weight loss
- general malaise
- fever
- bloated abdomen, swollen ankles
- abdominal pain in the upper right side
- anaemia, vomiting blood or passing black stools (denoting altered blood)
- changes in mental state – altered sleep pattern (awake at night), confusion, drowsiness.

### Causes of liver disease

Some of the causes of liver disease include:

- non-alcoholic fatty liver disease ('fatty liver')
- hepatitis virus infections
- alcohol-related liver disease
- toxic effect of medications, herbal medicines
- liver injury resulting from cells of the immune system attacking the liver
- inherited ('congenital') abnormalities of the liver – these may involve
  - accumulation of iron and copper in the body
  - some rare enzyme disorders
- conditions leading to liver cell or bile duct damage.

### Disorders of the liver

Some disorders of the liver include:

- **fatty liver** – this is the most common of the alcohol-induced liver disorders. Fat accumulates inside the liver cells, causing cell enlargement (steatosis) and sometimes cell damage (steatohepatitis). This can lead to cirrhosis. Similar changes are also seen in people who do not drink excessive amounts of alcohol but are overweight, obese or have diabetes. The liver becomes enlarged, causing discomfort on the upper right side of the abdomen
- **cirrhosis** – this has many causes, but is commonly due to hepatitis infection or excessive alcohol intake. The cells of the liver are progressively replaced by scar tissue, which seriously impairs liver functioning
- **hepatitis** – a general term meaning inflammation of the liver. It is also used to refer to infections of the liver by specific viruses (hepatitis A to E)
- **haemochromatosis** – this inherited disease makes the body absorb and store higher than normal amounts of iron. This damages many organs including the liver, pancreas and heart
- autoimmune liver disorders – damage resulting from an abnormal immune response to liver cells. These conditions are rare . They may include:
  - autoimmune hepatitis (mostly women affected)
  - primary biliary cholangitis (mostly women affected)
  - primary sclerosing cholangitis (more common in men)
- cancer – primary cancers can arise in the liver, most often in patients with cirrhosis. Stray cancer cells from a tumour elsewhere in the body may cause a secondary tumour in the liver
- galactosaemia – the body's reaction to particular milk sugars damages the liver and other organs. This is a rare inherited disorder

- alpha-1 antitrypsin deficiency – this is another rare inherited disorder. It can cause cirrhosis of the liver and lung damage
- **Wilson disease** – a genetic disorder where the liver can't excrete copper. Various organs of the body, including the liver and brain, are affected by the excessively high copper levels.

### Complications of liver disease

Without treatment, complications from liver disease may include:

- hepatic encephalopathy – scar tissue prevents the proper flow of blood through the liver, so that toxins remain. These circulating toxins, particularly ammonia, affect brain functioning and can lead to a coma
- ascites – where liver disease cause a build-up of body sodium ('salt'), which leads to fluid retention in the abdominal cavity. Fluid retention in the legs, feet and back may also occur. This is called oedema
- liver failure – the liver cells are destroyed faster than the liver can replace them, until the organ can no longer function adequately
- cancer – cirrhosis or some forms of hepatitis can make the liver more susceptible to primary cancer (cancer that originates in the liver)
- gastrointestinal bleeding – the veins that normally travel through the liver may be blocked because of cirrhosis. These veins then bypass the liver and may travel along the stomach or oesophagus lining, where they may rupture and bleed.

### Diagnosis of liver disease

Liver disease is diagnosed using a number of tests, including:

- physical examination – the liver may be enlarged
- medical history – including medications and lifestyle factors such as:
  - diet and alcohol consumption
  - exposure to hepatitis viral infections
  - blood transfusions
  - tattoos
  - family history of liver disease
- blood tests – to check:
  - the levels of liver enzymes
  - jaundice
  - the protein production capability of the liver
- ultrasound scan of the abdomen ('belly') – this is a three-dimensional scan using sound waves. It is used to look at the liver and other organs, check their size and shape. It is also used to check the liver for abnormal lumps and assess fluid accumulation
- other scans – including computed tomography (CT) scan and magnetic resonance imaging (MRI)
- transient elastography (FibroScan®) – a scanning device using ultrasound waves to assess liver scarring by measuring how stiff the liver is
- biopsy – a small piece of liver tissue is removed and examined under the microscope in a laboratory.

### Treatment for liver disease

Treatment depends on the cause, but may include:

- avoiding alcohol and any drugs that might damage the liver
- a well-balanced, nutritious diet – some people need a modified diet (for example, low salt)
- medications, such as antiviral drugs to treat viral infections
- specific medications to manage Wilson disease
- periodic removal of blood to bring iron levels down to normal (in patients with haemochromatosis)
- surgery, chemotherapy and radiotherapy, or liver transplantation are the usual treatments for liver cancer

- liver transplant may be a treatment option for people whose liver is failing.

### **Where to get help**

- Your **GP (doctor)**

**This page has been produced in consultation with and approved by:**

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