CONDITION

Metabolic dysfunction-associated steatohepatitis

MASH is liver fat buildup linked to metabolic problems that causes inflammation and liver cell damage.

WHAT IT IS
Inflamed, damaged fatty liver linked to metabolic dysfunction

BODY SYSTEM
Liver and metabolism

MAIN SYMPTOMS
Often none, fatigue, right upper abdominal discomfort

WHAT CAUSES IT
Metabolic dysfunction with liver fat buildup

HOW IT IS DIAGNOSED
Liver biopsy; imaging and blood tests assess scarring

MAIN TREATMENT
Weight management, metabolic care, and liver-directed medicines

CAN IT BE CURED?
Sometimes - liver inflammation can resolve

IS IT AN EMERGENCY?
Sometimes - vomiting blood or sudden confusion

LONG-TERM OUTLOOK
Often stable; advanced scarring raises serious health risks

Overview

Metabolic dysfunction-associated steatohepatitis, or MASH, is a condition in which excess fat in the liver is accompanied by inflammation and liver cell damage. It was previously called non-alcoholic steatohepatitis, or NASH.

MASH is a more active form of metabolic dysfunction-associated steatotic liver disease, known as MASLD. MASLD means that fat has built up in the liver in someone with at least one metabolic risk factor, such as type 2 diabetes, excess body weight, abnormal cholesterol levels, or high blood pressure.

Not everyone with liver fat has MASH. Many people have fat without significant inflammation

or injury. With MASH, ongoing damage can lead to fibrosis, which means scar tissue. Severe fibrosis may eventually become cirrhosis, where extensive scarring changes how the liver works.

MASH matters because it affects more than the liver. The metabolic problems linked to it also increase the risk of heart attack, stroke, kidney problems, and diabetes complications. Heart and circulation conditions are major long-term concerns for many people with MASH.

Symptoms

MASH often causes no noticeable symptoms, including when fibrosis is present. It may first be suspected after blood tests or imaging performed for another reason.

When symptoms occur, they may include:

These symptoms are not specific to MASH and can have many causes. Their severity does not reliably show how much liver damage is present. Someone with few symptoms may have significant fibrosis, while another person with fatigue may have little scarring.

Symptoms such as a swollen abdomen, yellow skin or eyes, confusion, or vomiting blood can occur when cirrhosis becomes advanced. These are not typical early symptoms and need prompt medical attention.

- Ongoing tiredness
- A dull ache or discomfort under the right ribs
- A general feeling of being unwell

Causes and risk factors

MASH develops when liver fat, metabolic stress, inflammation, and the body's response to injury interact over time. There is no single cause.

Insulin resistance is an important part of the process. Insulin is a hormone that helps move sugar from the blood into cells. When the body becomes less responsive to it, more fat may reach or be made by the liver. In some people, this contributes to inflammation and liver cell damage.

Factors associated with a higher risk include:

People can develop MASH without obesity, and not everyone with these risk factors develops it. Genes, age, diet, physical activity, medicines, other health conditions, and the gut

microbiome may all influence risk.

Alcohol is not the defining cause of MASH. However, alcohol can add to liver injury. Some people have both metabolic risk factors and alcohol-related liver damage.

- Type 2 diabetes or prediabetes
- Overweight or obesity, especially fat carried around the waist
- High triglycerides or abnormal cholesterol
- High blood pressure
- Sleep apnoea, which repeatedly interrupts breathing during sleep
- Polycystic ovary syndrome
- A family history of fatty liver, MASH, or cirrhosis
- Certain genetic backgrounds or inherited gene variants

Diagnosis

There is no single routine blood test that confirms MASH.

Blood tests may show raised liver enzymes, such as ALT or AST, which can indicate liver cell irritation. Normal liver enzymes do not rule out MASH or significant fibrosis. Tests are also used to look for other causes of liver injury, including viral hepatitis, autoimmune conditions, iron overload, and medicine-related effects.

A clinician may combine age and blood test results in a fibrosis score, such as FIB-4. This helps estimate the chance of advanced scarring. It does not directly diagnose MASH.

Ultrasound, CT, or MRI can detect or measure liver fat. Elastography uses ultrasound or MRI technology to estimate liver stiffness, which can suggest fibrosis. Inflammation, recent meals, and other factors can sometimes affect stiffness measurements.

A liver biopsy is the test that can directly confirm MASH. A small sample of liver is examined for fat, inflammation, damaged or swollen liver cells, and fibrosis. Biopsy is not needed for everyone. It may be considered when the diagnosis is uncertain, tests suggest significant fibrosis, or the result would change treatment.

Fibrosis is commonly described in stages. Lower stages mean little or no scarring. F2 and F3 mean moderate to advanced fibrosis without cirrhosis. F4 means cirrhosis.

Treatment and management

Treatment aims to reduce liver fat and inflammation, prevent further scarring, and lower heart and metabolic risks. The plan is based on fibrosis, other health conditions, medicines, and personal circumstances.

Sustainable weight loss can reduce liver fat. Larger, maintained losses may also improve inflammation and fibrosis. The most suitable approach may involve changes to food portions and patterns, physical activity, behavioural support, weight-management medicines, or metabolic surgery. MASH can also occur in people who are not overweight, so weight loss is not an appropriate goal for everyone.

Eating patterns that limit highly processed foods, sugary drinks, and excess saturated fat may support liver and heart health. Vegetables, fruit, whole grains, legumes, nuts, fish, and unsaturated fats can form part of a balanced pattern. Extreme "liver detox" diets and supplements have not been shown to remove fibrosis, and some supplements can injure the liver.

Regular activity can reduce liver fat and improve blood sugar, fitness, and heart health, even without major weight loss. Activity can be adapted to your mobility, fitness, and other conditions.

Diabetes, cholesterol, blood pressure, and sleep apnoea should also be managed. Cholesterol-lowering statins like atorvastatin or simvastatin are used to reduce cardiovascular risk and are generally considered safe for people with MASLD, including many with compensated cirrhosis. They are not a direct treatment for MASH inflammation.

In the United States, liver-directed options for certain adults with noncirrhotic MASH and moderate-to-advanced fibrosis include resmetirom and semaglutide. Resmetirom acts on a thyroid hormone receptor in the liver and can reduce liver fat and fibrosis-related injury. Semaglutide acts like the natural GLP-1 hormone, affecting appetite, blood sugar, weight, and metabolic health. Approval and access differ by country, and these medicines are not suitable for every person.

People with cirrhosis need different monitoring and treatment. This may include screening for liver cancer and enlarged veins in the digestive tract. Liver transplantation may be considered when the liver can no longer perform its essential functions.

Complications

MASH does not always progress. When it does, the main liver complication is increasing fibrosis.

Cirrhosis can reduce blood flow through the liver and interfere with its functions. Possible complications include:

Liver cancer can occasionally develop before cirrhosis, but the risk is highest once cirrhosis is present.

MASH is also associated with cardiovascular conditions, type 2 diabetes, chronic kidney problems, and sleep apnoea. For many people, protecting the heart and blood vessels is as important as monitoring the liver.

- Fluid buildup in the abdomen or legs
- Enlarged veins in the oesophagus or stomach that can bleed
- Confusion caused by toxins the liver cannot clear
- Liver cancer
- Liver failure

Prevention

MASH cannot always be prevented. Genetics and health conditions can affect risk, and some people develop it despite having no obvious lifestyle risk factors.

Where metabolic risk is present, maintaining a weight that is healthy for you, staying physically active, and managing blood pressure, cholesterol, and blood sugar may reduce the chance of developing MASH. These steps may also slow liver injury after it develops.

Alcohol can worsen liver damage. The safest amount is not the same for everyone, particularly when fibrosis or cirrhosis is present. Avoid unregulated supplements marketed as liver cleanses, because natural products can still cause liver injury.

Living with it and what to expect

MASH usually changes over years rather than days. In some people, liver inflammation and fibrosis improve with sustained treatment. In others, scarring remains stable or progresses. Diabetes, increasing fibrosis, and ongoing metabolic problems are linked to a greater chance of progression.

Routine follow-up may include blood tests, fibrosis scores, and elastography. How often these are needed is based on the fibrosis stage and other risks. People with cirrhosis generally need closer monitoring than those with little or no fibrosis.

Daily life often focuses on manageable long-term changes rather than a short course of treatment. Progress may be seen in blood sugar, fitness, weight, liver enzymes, or fibrosis measurements. A single abnormal result does not always mean the condition has suddenly worsened.

MASH does not automatically lead to cirrhosis or liver failure. Many people continue normal work, family, and social activities. Keeping follow-up appointments remains important because liver scarring may progress without obvious symptoms.

When to get medical help

Arrange routine medical follow-up if you have known MASH, abnormal liver tests, or imaging that shows liver fat. Seek an earlier appointment if tiredness or right-sided abdominal discomfort is persistent, or if you develop new abdominal swelling, leg swelling, easy bruising, dark urine, pale stools, or yellow skin or eyes.

Get urgent medical advice for new jaundice, rapidly increasing abdominal swelling, fever with abdominal pain, or a clear change in alertness.

Seek emergency help for:

These symptoms can indicate internal bleeding or advanced liver complications.

- Vomiting blood or material that looks like coffee grounds
- Black, tar-like stools
- Sudden confusion, extreme sleepiness, or difficulty waking
- Fainting, severe weakness, or breathing difficulty

Common questions

Is MASH the same as fatty liver?

MASH is one form of fatty liver. It includes liver fat plus inflammation and liver cell damage. Someone can have MASLD with liver fat but without MASH.

Can MASH go away?

Liver fat and inflammation can improve, and fibrosis may sometimes decrease. Improvement usually requires sustained management of the factors contributing to liver injury. Advanced cirrhosis is less likely to fully reverse.

Does having MASH mean I drank too much alcohol?

No. MASH is linked mainly to metabolic dysfunction, not alcohol as the primary cause. Alcohol can still contribute to liver injury, and both types of damage can occur together.

What foods should I avoid with MASH?

There is no single banned food or required "MASH diet." It is generally helpful to limit sugary drinks, highly processed foods, and excess saturated fat while choosing a balanced, sustainable eating pattern. Needs differ if you also have diabetes, kidney problems, or cirrhosis.

How quickly does MASH progress?

Progression is usually measured over years, but there is no fixed timeline. Some people remain stable or improve, while others develop increasing fibrosis. The existing fibrosis stage and metabolic health help estimate risk.

Can normal liver blood tests rule out MASH?

No. Liver enzymes can be normal even when MASH or significant fibrosis is present. Blood tests are interpreted alongside risk factors, fibrosis scores, imaging, and sometimes biopsy.

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