CONDITION

Altitude headache

Learn how altitude headache develops, how it differs from acute mountain sickness, and when headache at high elevation needs urgent care.

WHAT IT IS
Headache caused by lower oxygen at high elevation

BODY SYSTEM
Nervous system

MAIN SYMPTOMS
Bilateral headache, dizziness, nausea, unusual fatigue

WHAT CAUSES IT
Lower oxygen at high elevation

HOW IT IS DIAGNOSED
Clinical assessment of symptoms and ascent timing

MAIN TREATMENT
Rest, acclimatization, and descent

CAN IT BE CURED?
Yes, resolves with acclimatization or descent

IS IT AN EMERGENCY?
Sometimes, with confusion or loss of coordination

LONG-TERM OUTLOOK
Usually resolves without lasting harm

Overview

Altitude headache is a headache caused by exposure to the lower oxygen levels found at high elevation. It most often occurs after a person who is not acclimatized travels rapidly to about 2,500 meters, or 8,200 feet, above sea level or higher. Some people develop symptoms at lower elevations.

Acclimatization is the process by which the body adjusts to reduced oxygen. It begins soon after arrival but takes time. Traveling or sleeping higher before the body has adjusted increases the chance of altitude-related symptoms.

An altitude headache may occur by itself. It can also be the main symptom of acute mountain sickness, often called AMS. AMS includes headache plus symptoms such as nausea, dizziness, or unusual fatigue after a recent gain in altitude.

Most uncomplicated altitude headaches improve with rest, time to acclimatize, or descent to a lower elevation. However, a headache accompanied by confusion, loss of coordination, or shortness of breath at rest may signal a more serious altitude illness. Recognizing these warning signs matters because severe altitude illness requires immediate action.

Symptoms

Altitude headache usually begins within hours after arriving at a higher elevation. Under the International Classification of Headache Disorders, the headache typically develops within 24 hours of ascent and improves after descent.

The pain is often mild to moderate and felt on both sides of the head. It may become worse with physical activity, coughing, straining, bending over, or sudden head movement. Some people experience throbbing pain, although the pattern can vary.

Headache plus one or more of the following symptoms after ascent may indicate acute mountain sickness:

Poor sleep is common at altitude, especially during the first few nights. Periodic breathing-alternating deeper breathing with brief pauses-is also common during sleep. Although sleep disruption can make a headache feel worse, it is no longer part of the current Lake Louise scoring system used to assess AMS.

Altitude can also trigger a person's usual migraine or another primary headache condition. A migraine may cause one-sided or throbbing pain, nausea, and sensitivity to light or sound. Symptoms do not always fit neatly into one category, so persistent or unusual pain may need medical assessment.

Seek emergency help and descend if possible when a headache is accompanied by:

A sudden, extremely severe headache, or a headache with weakness, fainting, seizure, fever, a stiff neck, or a recent head injury also needs urgent evaluation. These symptoms may have a cause other than altitude illness.

- Dizziness or lightheadedness
- Nausea, loss of appetite, or vomiting
- Unusual tiredness or weakness
- Reduced ability to exercise or complete normal activities
- Confusion, unusual behavior, extreme drowsiness, or difficulty staying awake
- Trouble walking in a straight line or loss of coordination

- Shortness of breath while resting
- A worsening cough, chest tightness, or coughing up pink or bloody fluid
- Blue or gray lips or skin

Causes and risk factors

Air pressure falls as elevation increases. Although the percentage of oxygen in the air remains similar, each breath supplies fewer oxygen molecules. This reduced oxygen availability is called hypobaric hypoxia.

The exact cause of altitude headache is not fully understood. Lower oxygen levels affect blood flow and pressure within the blood vessels of the brain. Changes in the way the brain and blood vessels respond to oxygen and carbon dioxide may contribute to pain.

The most important risk factor is ascending faster than the body can acclimatize. Risk generally rises with a higher sleeping elevation, a larger daily gain in sleeping elevation, and a shorter time since arrival. Sleeping altitude matters because the body remains exposed to the lower oxygen level for many hours.

A previous altitude headache or episode of AMS suggests that a person may be susceptible during a similar trip. It does not guarantee that symptoms will happen again. Likewise, having traveled to altitude without symptoms in the past does not guarantee protection during a faster or higher ascent.

Physical fitness does not prevent altitude illness. Highly trained people may be at risk if they ascend rapidly, and their ability to exercise hard may lead them to gain elevation faster. Children can also develop altitude illness and may have difficulty describing headache or dizziness.

Dehydration, skipped meals, alcohol, lack of sleep, and heavy exertion can cause or worsen headaches during travel. However, dehydration is not the primary cause of AMS, and drinking excessive amounts of water does not prevent it.

People with heart or lung disease, certain blood disorders, pregnancy, or a history of severe altitude illness should discuss high-elevation travel with a clinician familiar with altitude medicine. The advice depends on the condition, planned elevation, rate of ascent, and access to medical care.

Diagnosis

Altitude headache is usually diagnosed from the symptoms and their timing. A clinician or trained trip leader will consider how high the person traveled, how quickly they ascended, when the headache began, and whether other symptoms are present.

A pattern that supports altitude headache includes recent ascent to high elevation, onset within about 24 hours, and improvement within several hours after descent. No blood test or scan is routinely needed for a straightforward case.

Acute mountain sickness is a clinical diagnosis, meaning it is identified from symptoms rather than a single test. Current Lake Louise criteria focus on headache after a recent altitude gain together with gastrointestinal symptoms, fatigue or weakness, or dizziness or lightheadedness. Symptom scores can support an assessment, but they do not replace judgment.

A pulse oximeter measures the percentage of oxygen carried in the blood. Oxygen readings normally fall at altitude and vary among people. Consumer devices can also give inaccurate readings because of cold fingers, movement, poor circulation, or device limitations. A reading by itself cannot confirm or rule out AMS.

Other possible causes should be considered when a headache is severe, unusual, persistent, or unrelated to the timing of ascent. These include migraine, tension-type headache, dehydration, viral illness, carbon monoxide exposure, medication effects, sinus problems, and neurologic emergencies.

Treatment and management

The first step is to stop ascending. A person with an altitude headache should not go higher while symptoms are present. Resting at the same elevation may allow mild symptoms to improve as acclimatization continues.

Light activity may be reasonable if symptoms are mild, but strenuous exertion can make a headache worse. Normal food and fluid intake should continue when possible. Fluids should replace ordinary losses without forcing excessive amounts.

Nonprescription pain medicines such as acetaminophen or ibuprofen may relieve headache for some people. These medicines are not suitable for everyone, and labels should be followed. A pharmacist or clinician can help if there are questions about kidney disease, liver disease, stomach bleeding, pregnancy, other medical conditions, or medicine interactions.

If symptoms worsen while resting at the same elevation, descent is the most reliable treatment. Even a modest decrease in elevation may help. A person with worsening symptoms should not descend alone.

Supplemental oxygen can relieve symptoms when it is available. A portable hyperbaric chamber, which temporarily raises pressure around the person, may be used in remote settings when immediate descent is not possible. It is a temporary measure and should not delay descent when severe illness is suspected.

Acetazolamide is a prescription medicine that speeds acclimatization and may be used to prevent or treat AMS in selected travelers. Dexamethasone can reduce symptoms of AMS and brain swelling but does not produce acclimatization. A clinician should decide whether either medicine is appropriate based on the trip plan, health history, and access to descent or medical care.

Gradual ascent is the main preventive strategy. Above about 3,000 meters, or 9,800 feet, the CDC and Wilderness Medical Society advise limiting increases in sleeping elevation and including regular rest days. A traveler's route may need to be adjusted for terrain, symptoms, and previous altitude experience.

Helpful preventive steps include:

- Spend time at an intermediate elevation before going higher when possible.
- Increase sleeping elevation gradually.
- Add a rest day after several days of ascent or after a large elevation gain.
- Avoid going higher while headache or other altitude symptoms remain.
- Keep exertion modest during the first day or two at a new elevation.
- Discuss preventive medication before travel if the itinerary involves rapid ascent or there is a history of altitude illness.

Complications

An isolated altitude headache usually resolves without lasting harm. The main concern is failing to recognize when headache is part of worsening altitude illness.

High-altitude cerebral edema, or HACE, is severe swelling and dysfunction of the brain related to altitude. It may develop from worsening AMS. Key signs include confusion, altered behavior, marked drowsiness, and ataxia, which means difficulty with balance or walking. HACE is an emergency requiring immediate descent, oxygen when available, and medical treatment.

High-altitude pulmonary edema, or HAPE, is fluid buildup in the lungs. It may occur with or without headache or AMS. Early features can include an unusual decline in exercise ability, cough, and breathlessness beyond what would be expected. Shortness of breath at rest, chest congestion, worsening cough, or blue or gray skin are emergency signs.

People with severe altitude illness should not wait for symptoms to improve overnight. They should not continue ascending, and they should not be left alone. When weather or terrain delays evacuation, emergency services or experienced expedition medical support should be contacted as soon as possible.

Follow up

A mild headache that fully resolves after acclimatization or descent usually does not require routine medical testing. The person should remain alert for returning symptoms if they ascend again during the same trip.

Arrange a routine medical appointment if headaches repeatedly occur at relatively modest elevations, continue after returning to low elevation, or are different from previous headaches. Follow-up is also useful after AMS that required prescription treatment or interrupted a trip. A clinician can review other possible causes and help plan a safer future ascent.

Anyone who has had HACE, HAPE, confusion, loss of coordination, or severe breathing symptoms should receive medical evaluation. Future high-altitude travel should be discussed with a clinician experienced in altitude medicine.

Seek urgent or emergency care for new neurologic symptoms, severe breathing difficulty, fainting, seizure, a sudden extreme headache, or symptoms that continue to worsen despite descent.

Sources

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