

## Altitude Illness

**Symptoms** of altitude illness can begin to occur at 8,000ft (2,400m) or lower, but serious altitude illness is rare below 10,000 ft (3,000 m). Symptoms occur due to your body not adapting well to having less oxygen at high altitudes. At 18,000 ft (5,500m), there is 1/2 the oxygen available as at sea level and it is about 1/3<sup>rd</sup> on top of Mount Everest. The body tries to adapt to lower amounts of oxygen in the air mainly by increasing the rate and depth of breathing so you breathe faster and deeper. There is also an increase in heart rate. Both of these mechanisms try to bring more oxygen to the body. There is a wide individual susceptibility to altitude which seems to be genetically determined - how well someone does at altitude seems related to how well they breathe at altitude.

**What happens to the body in altitude illness?** Lack of oxygen causes fluid leakage and accumulation in between cells in the brain and/or the lungs. Symptoms can be mild or severe. Mild symptoms of **Acute Mountain Sickness** or **AMS** are headache, loss of appetite, nausea, fatigue, lack of sleep and dizziness. These symptoms can resolve once someone is acclimatized to the altitude for example by spending one or two extra nights at the same altitude or going to a lower altitude. If symptoms worsen then the person must descend to a lower altitude as soon as possible.

Severe symptoms occur as AMS progresses due to fluid accumulation in the brain and/or in the lungs. These conditions are known as: **High Altitude Cerebral Edema (HACE)** or **High Altitude Pulmonary Edema (HAPE)**. HACE symptoms include mental confusion, hallucinations and difficulty with balance and co-ordination,. As the symptoms worsen, unconsciousness or coma can occur which can lead to death. HAPE results in shortness of breath while at rest, extreme fatigue, a cough which maybe dry or productive with frothy blood-tinged sputum and chest tightness.

**HAPE and HACE are severe symptoms and can be rapidly fatal if untreated.**

### Prevention of Altitude Illness:

**1. Having a sensible itinerary** is the most important way to avoid altitude illness. It is recommended to climb not more than 1,000ft (300m) a day above an altitude of 10,000 ft (3,000m). If the terrain is such that this is not possible, one needs to have two rest days e.g. 2 rest days are recommended at Namche Bazaar where 2,000ft (600m) are gained in 1 day from Phakding for most itineraries. Having **flexibility** with 1-2 extra days built into your schedule will allow you to rest when you are not feeling well and help avoid altitude illness. It also helps to 'climb high' and 'sleep low'.

**2. Use Diamox**-which blocks an enzyme in the kidney and makes the blood acidic which is interpreted by the brain as a signal to breathe more. Diamox therefore, enhances the physiological response to altitude by increasing the rate and depth of breathing and it also acts as a mild diuretic. Side effects of the drug are: tingling of fingers and toes and tingling around the mouth. Sulfa allergic individuals are recommended not to take this drug. Prophylactic dose of Diamox is half or one 250mg tablet twice a day. Use of Diamox will not mask the symptoms of altitude illness if it is to occur. Start taking Diamox the day before ascent to 10,000 ft (3,000m), continue it through your ascent to higher altitudes and stop when you start descending.

**3. Other preventive strategies** such as **Ginkgo Biloba** which was once thought to be useful for altitude illness prevention has not been found useful in several studies. **Salmeterol (Serevent)** inhaler used to treat asthma can help prevent HAPE and may be used by HAPE susceptible people prophylactically. For persons allergic to sulfa drugs and for abrupt ascents, it is possible to use dexamethasone, a very potent steroid drug.

### **Treatment of Altitude Illness**

For mild symptoms, one can stay at the same altitude to see if symptoms will resolve and ascend when symptoms have resolved completely. Diamox can also be used to treat mild to moderate symptoms. If symptoms persist or worsen at this altitude, descent is required.

For severe symptoms of HACE or HAPE, descent must begin immediately whenever feasible. Helicopter evacuation may be essential for descent unless there is rapid improvement with medical treatment and walking down is feasible. Physical exertion even when it is for descent can be detrimental for patients with HAPE. Severe HAPE patients should be carried down if helicopter evacuation is not possible.

### **Other treatment modalities to help during descent-**

**1. Diamox-** is generally useful for mild to moderate AMS. **Dosage:** One 250 mg tablet two or three times a day.

**2. Dexamethasone-** is a very potent steroid used in HACE temporarily to facilitate descent. This drug improves the symptoms but does not help acclimatization. It is not recommended to ascend while still taking this drug even if one is symptom free. **Dosage:** 4 mg every 6 hours.

**3. Nifedipine** – is useful in HAPE by lowering pressure in the pulmonary blood vessels and thereby decreasing fluid in the lungs. This drug also lowers blood pressure. **Sildenafil** (Viagra) is increasingly being used in treating HAPE.

**4. Oxygen** – is very useful particularly for HAPE.

**5. The Gamow Bag-** is a portable bag and when inflated, converts into a high pressure bag in which an individual with severe symptoms of HACE or HAPE is put into and air is pumped in with a foot-pump. Pressure created inside the bag increases the oxygen tension and a persons' symptom should improve rapidly. This is used to sustain a person during an acute crisis before descent is possible or pending helicopter evacuation. This bag is found in the Manang and Pheriche Himalayan Rescue Association Aid Posts, at Kunde Hospital and at several other locations in the Everest region. Many groups that trek to high altitudes in remote places are nowadays taking this bag with them. These can be rented in Kathmandu or brought in from abroad.

### **Three golden rules to avoid dying from altitude illness:**

- 1.** Learn the early symptoms of altitude illness and recognize when you have them. Remember, you may be the only person in a group with symptoms.
- 2.** Never ascend to sleep at a new altitude with any symptoms of AMS.
- 3.** Descend if your symptoms are getting worse while resting at the same altitude.