

## Altitude Illness

Symptoms of altitude illness can begin to occur at 8000ft (2400m) or lower still, but serious altitude illness is rare below 10,000 ft. (3000 m). Symptoms occur due to our body not adapting well to having less oxygen at high altitudes. At 18,000 ft. (5500m), there is 1/2 the oxygen available as at sea level and it is 1/3<sup>rd</sup> on top of Mount Everest. 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. Increase in the number of red cells occurs after staying at high altitude for 2 weeks or longer and is important for persons who live at high altitude. There is wide individual susceptibility to altitude which seems to be genetically determined.

What happens to the body in altitude illness? Lack of oxygen or hypoxia 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 e.g. by spending one or two extra nights at the same altitude or symptoms may worsen needing someone to descend to lower altitudes.

AMS can progress to **High Altitude Cerebral Edema (HACE)** and symptoms of HACE are mental confusion, difficulty with balance and co-ordination. Hypoxia can also lead to fluid accumulation in the lungs causing **High Altitude Pulmonary Edema (HAPE)**. HAPE results in shortness of breath at rest, extreme fatigue, cough - dry in the beginning, and later productive of frothy or blood-tinged sputum. HAPE and HACE are severe symptoms, often co-exist in severe cases and can be rapidly fatal if untreated. Treatment is DESCEND, DESCEND and DESCEND.

### 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 1000ft (300m) a day above an altitude of 10,000 ft. (3000m). 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 2000ft (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 of **Diamox**- Diamox blocks an enzyme in the kidney and makes the blood acidic which is interpreted by the brain as a signal to breathe more. Diamox thus enhances the physiological response to altitude and it also acts as a mild diuretic. Side effects of the drug are: tingling of fingers and toes and tingling around mouth. Persons with severe allergy to Sulfa drugs should not take this drug. Prophylactic dose of Diamox is ½ of a 250mg tablet (125 mg) twice a day. Use of Diamox will not mask the symptoms of altitude illness if it is to occur. Start taking Diamox same day or the day before ascent to 10,000 ft. (3000m), continue it through your ascent to higher altitudes and stop when you

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start descending. For persons allergic to sulfa drugs, it is possible to use **dexamethasone**(prescribed by physician), a very potent steroid drug prophylactically at 4mg twice daily for a short period of 2-3 days during abrupt unavoidable ascents.

**3. Other preventive strategies:** Pulmonary vasodilator drugs like **Nifedipine**, a potent blood pressure lowering medication can be used for HAPE prevention.

## **Treatment:**

**For mild symptoms**, one can stay at the same altitude to see if symptoms will resolve and ascend when symptoms have resolved completely. Diamox 250mg two or three times a day can be used to treat mild-moderate symptoms. If symptoms persist or worsen at this altitude, descent is required.

**For severe symptoms with 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 through during descent-

1. **Diamox-** Dosage: One 250 mg tablet two or three times a day. This is generally useful for mild-moderate AMS.
2. **Dexamethasone-** very potent steroid. Used in High Altitude Cerebral Edema or HACE temporarily to facilitate descent. This drug improves the symptoms without improving acclimatization. It is not recommended to ascend while still taking this drug by a symptomatic person. Dosage: 8mg initially, then 4 mg every 6 hours.
3. **Nifedipine-** useful in HAPE by lowering pressure in the pulmonary blood vessels and thereby decreasing fluid in the lungs. This drug also lowers blood pressure.
4. **Sildenafil** (Viagra) or Tadalafil may be useful in treating HAPE.
5. **Oxygen** - very useful particularly for HAPE.

**Gamow or PAC Bag** - This is a portable bag which, when inflated, converts into a high pressure bag in which an individual with severe symptoms of HACE or HAPE is put and air is pumped in with a foot-pump. Pressure created inside the bag increases the oxygen tension and a person can improve rapidly. This is used to tie a person over 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 Khunde Hospital and at several other locations in the Everest region. Many groups that trek to high altitude in remote places are nowadays taking this bag with them. These can be rented in Kathmandu or overseas.

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

1. Learn to recognize the early symptoms of altitude illness and be willing to admit 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.