

## High Altitude Syndrome

Travellers who will be visiting mountainous areas should be prepared to recognize and respond to the symptoms of high altitude syndrome. The human body can adjust to changes in altitude (known as acclimatization) but needs time. The time needed by each individual varies and also varies with each trip. If the ascent is too rapid and your body cannot adjust adequately, high altitude syndrome will occur. The syndrome covers a broad spectrum of symptoms, ranging from mild headache to Acute Mountain Sickness (AMS) and to the more severe High Altitude Cerebral Oedema (HACE) and High Altitude Pulmonary Oedema (HAPE). If the treatment is not received when symptoms appear, death could result.

### What is high altitude syndrome?

High altitude syndrome typically appears on rapid ascent to altitude above 2,500 metres (8,000+ feet), e.g. flying directly to Lhasa or La Paz from sea level. It is caused by the lowering of atmospheric oxygen pressure when ascending to high altitudes. The human body will compensate to the lowered oxygen pressure by increasing the pulse rate, breathing rate, blood pressure, while increased urination and mild isolated headache can occur. If a person ascends more rapidly than the body can adjust, symptoms of AMS will then occur gradually after few hours of ascent. AMS is suspected when the following occur on acute altitude gain:

- Headache (usually throbbing, on both sides, worse during the night and on awakening, made worse by bending over)
- Plus one of the following: nausea; fatigue; dizziness; sleep difficulty.

The headache condition in AMS is often described as similar to a bad hangover. The sleep difficulty may cause sudden awakening and a feeling of suffocation. Other symptoms include irritability, loss of appetite and swelling of the face, hands and feet.

Without proper acclimatization and continue to ascend, the illness may progress to the serious conditions of High Altitude Cerebral Oedema (HACE) and High Altitude Pulmonary Oedema (HAPE).

HACE means fluids accumulate in the brain. The condition can appear within as short as 12 hours to 3 days of onset of mild AMS and usually accompanied by HAPE. Once present, it can progress rapidly and can be fatal in a matter of a few hours. Early symptoms are:-

- Changes in behavior (disinterested, cannot count accurately)
- Disabling weakness (e.g. cannot rise up and go to toilet)
- Loss of coordination (stumble gait, cannot walk a straight line heel to toe).

In HAPE, fluids accumulate in the lungs and further aggravate the lack of oxygen. It is the most common cause of death in high altitude. Its onset may be abrupt and is characterized by:

- Decreased exercise performance (earliest symptom)
- Breathlessness even at rest
- Fatigue, weakness
- Lips or fingernails turned blue
- Cough with pinkish sputum (usually in late stage)

Long term stay at high altitude can induce chronic mountain sickness and deterioration of body functioning. This is rare as travellers seldom stay high for that long.

### Who is more prone to high altitude syndrome?

The occurrence of AMS is related to rate of ascent, sleeping altitude attained, length of stay at altitude, level of exertion and genetic susceptibility. The young and fit are not less vulnerable, while elderly seems to be so. The risk will be increased if the traveller has too much determination, exhausted, nervous, dehydrated, exposed to cold, or suffering from respiratory tract infection.

## How can I prevent high altitude syndrome?

- In general, cardiopulmonary diseases will be affected adversely by the decrease of oxygen pressure. Thus travellers with poorly controlled high blood pressure, angina, chronic obstructive airway disease, anaemia, and epileptics should seek medical assessment first for fitness to travel to high altitudes.
- Those with illness which affects oxygen exchange, e.g. influenza should defer travel until full recovery.
- Avoid flying or driving directly to high altitudes (e.g. Lhasa, La Paz). If this is impossible, take more rest, minimize exertion, drink more water, avoid alcohol, large meals and sleeping pills during the first few days after landing for proper acclimatization.
- The simplest way to avoid or reduce the symptoms of AMS is to ascend slowly to allow enough time for acclimatization. Methods include:-
  - when ascending, acclimatize for 2 to 3 nights at 2,500 to 3,000 metres.
  - after reaching 3,000 metres, keep your sleeping altitude gain between 300 to 600 metres per day.
  - for every 1,000 metres gained, stay at same altitude for 1 extra night.
  - climb higher during the day, sleep lower during the night.
- Keep warm to prevent cold exposure. Adopt a relaxed attitude helps to get acclimatized.
- Be aware of symptoms of AMS, HACE and HAPE in yourself and among companions, and take appropriate remedial actions. Never ignore the early warning symptoms and signs.
- Don't force yourself to keep up with the pace of the trekking group or to attain the target altitude. If necessary, leave the group and descend immediately, even at night. This is because HAPE can be fatal within a few hours.

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## What should I do if I begin to have symptoms?

- For mild symptoms, limit your activity level and remain at the same altitude for a day or two until full recovery before resuming the ascent.
- Descent is the definitive treatment for all forms of high altitude syndrome. You must descend if symptoms do not subside after 24 hours or become worse. A drop in altitude of 500 to 1,000 metres is usually effective.
- If you suffer from symptoms of HACE and HAPE, you should descend immediately and seek treatment.
- The drug acetazolamide can lessen AMS symptoms and help with acclimatization. It is taken one day before ascent and continued for several days at altitude. As the drug may not be suitable for everyone, please consult your doctor.
- Herbal medication Rhodiola rosea has been used for prevention but needs to be taken at least 5 days before ascent. However, their effects have not been proven clearly by large scale randomized control trial. Please consult your doctor for further information.

## How to treat high altitude syndrome?

- For mild isolated headache, one must rest more and should not purely rely on pain killer to relieve pain.
- If symptoms of AMS persist for more than 24 hours, one must descend immediately, which is the best effective treatment.
- For AMS, the drug acetazolamide can also be used for treatment. It is given at onset of symptoms and continued for one day after symptoms have cleared. For HACE and HAPE, there are specific drugs available, but their effectiveness cannot match that of immediate descent. Please consult your doctor for further information.
- Breathing oxygen at altitude lessen symptoms but is not advisable if one stay at altitude for long.

## Where are the high risk areas?

Typical examples of cities or areas above 2,500 metres are:

Country		Area/City	Altitude
China	Sichuan	Jiu Huang airport	3,400+ m
		Huanglong	Average 3,300 m
		Daocheng, Yading	Average 3,700 m
	Yunnan	Shangri-La	3,200+ m
		Yulong Xueshan cable car	4,500 m
	Qingzang Gaoyuan	Qinghai Hu	3,200 m
		Lhasa , Gonggar airport	3,500+ m
		Ngari diqu, Naqu diqu	Average 4,500 m
		Qomolangma base camp	5,200 m
Nepal		Tenzing-Hillary Airport	2,800+ m
		Manang	3,500 m
		Pheriche	4,300 m
		Sagarmatha base camp	5,400 m
Tanzania		Mount Kilimanjaro	5,800+m
Bolivia		La Paz	3,600+ m
Colombia		Bogotá	2,600+ m
Ecuador		Quito	2,800+ m
Peru		Cuzco	3,300+ m



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