FAQ’s - Altitude Mountain Sickness (AMS) with special emphasis to Ladakh

1. What is Altitude Sickness?

This is the effect of high altitude on the human body mainly caused by low amounts of oxygen at these altitudes. This is what many people on the Manali-Leh route report when they travel by road from Manali (6300 feet) to Sarchu (14670 feet) for the first night halt.

2. Is Altitude Sickness and Acute Mountain Sickness (AMS) same?

Altitude Sickness, Acute Mountain Sickness, hypobaropathy and soroche are all used interchangeably to explain sickness due to effects of high altitude on the human body.

3. What is high altitude?

Heights of 8000 – 12000 feet is considered High Altitude, 12000-18000 is Very High and above 18000 Extremely High. Most of Ladakh is above 10,000 feet and many passes you have to cross like Baralacha La, Lachung La, Chang La, and Kardung La are all above 16000 feet, where chances of AMS is present.

4. What causes Altitude Sickness?

A little background on barometric pressures and effect on oxygen saturation in the human body would be useful. When we inhale at sea level, the pressure oxygen exerts in our alveoli is greater than the pressure of blood in the lungs and this pressure gradient drives oxygen at the alveolar level, into the blood. As we ascent the pressure of oxygen entering the lungs decreases resulting in lesser oxygen entering the blood. Sea level concentration of oxygen is about 21% with pressure of 760 mmHG. Once you cross 12000 feet the pressure drops below 483 mmHG and you get to breathe only 40% oxygen molecules compared to normal levels. Due to hypoxia a series of symptoms develop which manifests as AMS.

The exact cause is not fully understood. Many factors contribute to onset and magnitude of the problem like speed of climb, height reached, intensity of physical activity, individual susceptibility, hydration, nutrition and psychological state. All these individually or collectively interplay to reduce or increase the intensity of the problem.

5. Who is susceptible to Altitude Sickness?

This is the million dollar question. There is no set rule, some people get hit and some don’t. Lots of people go up to 8000 feet with no effect, some climb all the high passes for the first time without having any problems, it’s just the luck of the draw. Strangely factors like physical condition, age and sex does not seem to have any connection with Altitude
Sickness. One study states that above 10000 feet, 75% of people will have mild symptoms.

Reports and personal experience from Ladakh suggest that young children were symptom free while fit adults who had no history of sickness had to rush back to Delhi by air due to AMS. We have witnessed a very old lady at Kardung la, 18380 feet while her fit looking husband was panting for breath and nearby a child of 10 years was playing in the snow happily. The soldiers there report they are also hit by AMS if they spend continuous time up there and hence they are rotated to low altitudes. So, there’s are no guarantees with AMS.

6. What are the signs and symptoms of altitude sickness?

Usually symptoms start 12-24 hours after reaching high altitude and start to decrease around the 3rd day once acclimatization starts. Headache is the most common one combined with any set of others like, lack of appetite, nausea and vomiting, weakness, light-headedness, inability to sleep, pins and needles pains, breathing difficulty on exertion, nosebleed, rapid pulse, drowsiness, general lack of interest, swelling of hands, feet or face.

Personal experience with AMS for me on the Srinagar Leh route: on the road from Srinagar-Kargil around Zozila (11580 feet), we had to wait for 45 mts and headache started, after the descent into Mathayan, I vomited twice, got disoriented and had to hand over driving to a friend. That day at Kargil and the next day on the road to Rangdum I had classical symptoms like headache on and off, lack of appetite, nausea, breathing difficulty on exertion and drowsiness. On the 3rd day, symptoms gradually disappeared till I reached Leh but for me to be fully back to normal took 6 days of acclimatization. My other two co-passengers were having mild symptoms like headache, weakness and light-headness, but it lasted only for 2 days for them.

A self-diagnosis instrument, a questionnaire, recognized worldwide for self-assessment and clinical assessment called The Lake Louise Assessment System of AMS is available here.

http://www.abdn.ac.uk/~src248/peru/d...ms_scoring.doc

Severe symptoms can be dangerous, get medical attention ASAP. Some of them are; pulmonary oedema (filling of fluid in the lungs), continuous dry cough, fever, difficulty to breathe while at rest, headache that does not go away even after analgesics and rest, differences in walking or postures, loss of cognition, retinal bleeding. High altitude causes fluid accumulation in the body, this leads to dangerous conditions like High Altitude Pulmonary Oedema (HAPE) or High Altitude Cerebral Oedema (HACE). Both conditions require emergency medical attention and evacuation to lower altitudes. Incidence of HAPE is 2% for those who cross 9500 feet and HACE 1%.
7. What is periodic breathing?

This is also called Cheyne-Stokes Respirations. This is not AMS. Some people experience sleep disturbance at high altitudes or altitudes above their threshold. This is a pattern of breathing during sleep; breathing gradually slows, goes to breath-holding, a recovery and accelerated breathing. The breath-holding may last for 10-15 seconds, the affected person wakes up with anxiety and sometimes panics into thinking he has HAPE or some other serious problem. It is important to reassure the person and allow him to acclimatize; after acclimatization periodic breathing is known to reduce.

8. What is acclimatization?

A process of adjustment the human body makes to the decreased oxygen. The body brings about a series of changes to adopt like increasing production of RBC’s to carry more oxygen, more oxygen release from RBC’s to tissues, breathing becoming more deeper, increased pulmonary arterial pressure to force blood into nooks and corners of lungs previously not used etc., This happens slowly and requires time depending on different variables. Seasoned climbers acclimatize their body by climbing in 1000 feet instalments and staying for a day after every 3000 feet to allow the body to adjust to hypoxic conditions.

The advice to travel through Srinagar-Kargil-Leh is valid as the ascent is gradual and allows the body to acclimatize slowly whereas the climb through Manali route is sudden and acclimatization is not sufficient leading to high chances of being hit by AMS. In order to do the Manali route safely, ideal would be to spend a couple of days at Manali, Jispa and then at Sarchu before proceeding to Tso Moriri, Pangong Tso or Leh.

9. How do people who fly in from Delhi / Srinagar acclimatize?

Many people who fly in are affected by AMS from the airport itself, they take it easy for the first 2-3 days at Leh; majority of them become OK and enjoy the holidays. There are cases where the AMS becomes acute; under medical advice, people have cancelled their trip and taken the next flight back to Delhi / Srinagar.

10. What about people living in hilly areas permanently?

Studies have shown that mutations happen in genes of people who live permanently in high altitudes. The South American Andean tribes evolved to have bigger chests, larger lungs, higher haemoglobin levels and a special breathing rhythm.

Likewise the Tibetan studies have shown that more children with higher oxygen saturation rates survived, indicating evolution to hypoxic condition.
A great resource here is Prof. Cynthia Beal, a physical anthropologist at Case Western Reserve University in Cleveland, Ohio, linky to this interesting articles:

Three High-Altitude Peoples, Three Adaptations to Thin Air

The bottom line, people adopt to high altitude living and live normally.

11. What can be done to prevent AMS?

Climbing slowly and acclimatizing is the best way to avoid or minimize the effects of AMS.

• If you cross 10,000 feets it is best not to exert or move up higher for the first day. Experts advise an increase of 1000 feets per day and a full rest day for every 3000 feet gained. Even seasoned climbers stick to the dictum of climbing more than 1000 feets but coming back to sleep at lower altitudes.

• If symptoms persist or increase, move down ASAP.

• Drink lots of fluid to keep yourself hydrated, twice your normal intake is OK and a thumb rule is minimum of 3 litters of water per day.

• Sleep is NOT the best solution; sleep depresses respiratory system, light activity is better.

• Eat a diet high in carbohydrate, more than 70% of the diet. Altitude increases blood glucose utilization and reduces fat as a source of energy. Carbohydrate burn 8-10% less oxygen for metabolism compared to fats and diets high in carbohydrate has demonstrated lesser incidence of AMS. Some carbohydrate dense foods are rice, rotis of whole wheat, wheat bread, liberal spreads of honey and jams, glucose drinks, dry fruits specially dry dates, cakes / pastries, energy chocolate bars etc.,

• Do not use tobacco, alcohol or anti depressant drugs, all of them increase chances of respiratory depression.

12. What is the medical treatment for AMS?

**Diamox (Acetazolamide)** is the most widely used drug. It works by acidifying the blood which triggers increased breathing and drives more oxygen into the boood. The action of Diamox also increases bicarbonate diuresis, frequency of urination will increase.

Diamox is a sulpha drug, if you have sulpha allergy, DO NOT take it. Some side effects include ringing sensation in the ear, numbness, tingling, taste alterations and vibrating sensations in the hands and feet.
Recommended dosage for AMS: 250 mg every 12 hours, to be discontinued once symptoms disappear. Children – 2.5 mg/kg body weight every 12 hours, to be discontinued once symptoms disappear. For periodic breathing: 125 mg, 1 hour before bed time, to be discontinued once you move below the threshold altitude. For prophylaxis of AMS, mountain experts advise taking 125 mg, every 12 hours, 24 hours before reaching high altitude.

Some basic concepts about Diamox need to be clarified. Experience from reading many blogs, articles suggest there are misconceptions floating around:

- Diamox does not mask symptoms of AMS. If a person acclimatizes, symptoms resolve, if not symptoms persist then AMS is on. Diamox only helps you combat faster. This drug is trusted in practice by most high altitude climbers and is used widely to help combat AMS.

- Diamox will not help you survive if you keep climbing with AMS. With or without Diamox, if your symptoms persist, stay put or climb down.

- If Diamox is stopped suddenly, symptoms will not worsen. If you stop taking Diamox while acclimatizing and if AMS is still present, symptoms will reappear.

- Starting on Diamox is effective even after symptoms of AMS appear.

- Diamox is not a substitute for acclimatization, it aids in acclimatization.

- Many physicians and doctors in the plains are clueless about Diamox use in AMS. Your ophthalmic doctor would probably know about its use in Glaucoma, but not likely in AMS.

Dexamethasone is a steroid used to treat oedema. How it works in AMS is unknown, this drug removes symptoms of AMS fast, but has the potential to mask symptoms of AMS. Be sure that effects of the drug has worn off and AMS symptoms have disappeared before starting for higher altitudes. Recommended Dosage to treat AMS: 4 mg, 6th hourly. Being a steroid this has to be used under the strict supervision of a doctor.

Analgesics like aceclofenac, Ibuprofen and paracetamol are effective to relieve headache. Stronger analgesics like Tramadol, Dextropropoxyphen and benzodiazepines like diazepam that act centrally MUST be avoided as they can depress the respiratory centres. Temazepam has been used for treating periodic breathing effectively.

Oxygen: Oxygen can help combat effects of AMS, small amounts will help patients, continuous oxygen inhalation is recommended only for serious cases. Oxygen is available in many district hospitals and main military centres in Ladakh for genuine cases.
In high passes like Kardung Ka and Chang La, the Indian Army has medical officers with finger Oxymeters to find out severity of AMS for affected people. Oxygen saturation below 60% on the Oxymeter is considered requiring medical attention, levels above 70% are good. Most of us, when tested at Chang La had levels above 70% and were pronounced OK.

**Gamow bag** is used for AMS. This is a portable high pressure sealed bag inside which the patient is placed and air pumped in, increasing oxygen concentration inhaled, simulating reduction of 5000 feet immediately. A 2 hour session is enough to reset the body dynamics to near normal and the effects last around 10-12 hours, enough time to move the patient to lower altitude. The whole gizmo weighs 7 kg and is even rented out for trekking expeditions.

In Ecuador, Peru and Bolivia tea made from coco plant is reported to be very effective for AMS. In India, COCA6X, a homeopathic drug is reported to be effective for AMS. Gingobiloba, an ayurvedic drug was used but no conclusive evidence exists for its efficacy.

From experience of people going to Ladakh, two schools of thought have emerged. One set start taking Diamox somewhere around Srinagar / Manali or 24 hours before they start reaching heights of Zojila or Sarchu. Another set start with Diamox only after symptoms start. The 3rd set, ignorant or indifferent about AMS, don’t take anything and majority of times come out unscathed. Ignorance is bliss here, until hit by AMS 😊

I had moderate AMS at Kargil, symptoms were improving and hence decided to take paracetamol and not Diamox. 2 days of moderate activity, hydration, deep breathing and paracetamol to relieve headache was therapeutic. Eventually on day four I was OK without any medicine and back to near normal levels, on day six I was fully normal.

There are those who carry oxygen bottles and use it when needed, but these get exhausted very fast. Experience on the Malani-Leh and Srinagar-Leh route is full of stories where Indian Army help patients reach the nearest medical facility.

13. What are the medical facilities available in Ladakh?

On the Manali – Leh route, district hospitals are at Kullu, Keylong. At Manali there are private hospitals which can cater to emergencies.

In Leh there is a district hospital and the military hospital there is very well equipped and caters to the public needs. There are also private doctors and hospitals in Leh for emergencies.

There’s a well-equipped district hospital in Kargil and medical dispensaries at Drass, Mulbek, Trespone, Sankoo, Panikhar and Padum.
In real emergencies J&K tourism can arrange IAF helicopters which involves guarantees of payment and about Rs.75,000/- per hour of flying.

14. **How can one enjoy a holiday with AMS hanging over their heads?**

Ladakh is NOT a holiday destination; it is an ADVENTURE Holiday destination. The key word here is ADVENTURE. Many times travel agents / marketers package it like a morning walk without explaining fully the difficulties of the destinations. Facilities are basic, you may have to live rough, eat what you carry / is available and chances of room-service very low.

Like any other, it has its beauty and risks, AMS is one of them, and you need to take a calculated risk. Many people who mistake Ladakh tour to be the garden variety holiday destination could be in for a shock. There are cases where people have abandoned their bikes, cars at Leh and taken a quick flight back to Delhi; unable to combat AMS or after finding the driving conditions too tough. Conditions could change overnight, temperatures could go below zero, snow falls, rivulets and landslides can block out roads for days, and vehicles could get trapped in huge traffic blocks. But for a responsible and prepared tourist who travels with his eyes wide open, this would be like an ADVENTURE destination no other place in the world can offer.

15. **So much information on AMS is scary; do I need so much information?**

Agreed, so much may appear too much. Responsible living is all about being informed fully about both sides of the coin, taking informed decisions and taking calculated risks. Everyday living is full of calculated risks.

Sources: The FAQ’s are made after reading many articles, books, blogs, personal discussions with people affected with AMS, experiences of Leh road travelers, my own experience with AMS and research papers from all over the web. This presents the current thinking of the subject.

Acknowledgements: Thanks to all the contributors who have written on the subject and discussed extensively with me on the subject.

Disclaimer: The FAQ’s are designed to give basic information about AMS for a prospective traveler to high altitude. This in no way is complete as AMS research and medication is evolving constantly, the reader is responsible to update his knowledge and take own decisions based on his own judgment. He/ She is advised to take medication after getting sound medical advice from an authorized doctor.

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