

# MANAGEMENT OF HIGH ALTITUDE SICKNESS: A REVIEW

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**Abstract:** Altitude Sickness is one of the most health concerning factor one face at High Altitude resulting in severe health consequences due to the lack of body to adjust accordingly to the environment. Present study highlighted the different management methods one can adapt to survive at higher ranges. Also stating the beneficial impacts of certain drugs and herbs in treating the altitude sickness.

**Index Terms – Altitude Sickness, High Altitude Pulmonary Edema, Hypoxia, Acclimatization.**

## I. INTRODUCTION

Lots of people travel at higher altitudes for various purposes like climbing mountains, army people serving the nation at higher elevations, often faces bundles of health sickness which are collectively termed as High Altitude Sickness. It can be cured easily at early stages by following certain preventable parameters but can also sometimes lead to having life deathly consequences on health if not been treated correctly. High Altitude is the region where one ascends to the higher elevation above sea level. It is been classified into different ranges (Hooda, 2016): starts from 1500m above sea level, 1500m-3500m (moderate high altitude), 3500-5500m (very high altitude), 5500m-8850m (extremely high altitude). Altitude sickness also referred as mountain sickness is one of the life-threatening conditions which strike during the duration one heading towards higher altitudes. It generally thrives when one travels the zone above 2500m. One of the biggest factors causing Altitude sickness is lack of availability of oxygen as the reason being decreased in atmospheric pressure while ascending to higher ranges causing hypoxia, HAPE, HACE, Frostbites, Chilblains and lots of other health sicknesses. Acclimatization is an important aspect during climbing at higher altitude for the cause of restoring tissue oxygenation and building up the resistance and tolerance for excessive cardiac output, while also normalizing the PH levels of RBCs in blood. Altitude Sickness can be diagnosed easily by following symptoms like Headache, Disorientation, Nausea, difficulty in standing etc. These symptoms of health sickness can be treated using various natural remedies, herbal intake and drug intake and a good eye check on the diet.

## II. TYPES OF HIGH ALTITUDE SICKNESS

According to numerous studies, there are varieties of altitude sickness problems that affect the health status of an individual, some of them are listed below:

1. AMS (Acute Mountain Sickness): One of the basic reasons for the cause of AMS is when the person climbs up the higher altitude all of a sudden or at a rapid speed.

The following are the symptoms one may experience-

- Insomnia
- Anorexia i.e. loss of appetite
- Nausea and vomiting
- A headache
- Increase in rapid pulse
- Discomfort
- Shortness of breath

If the above symptoms are not be taken care of can lead to severe consequences.

2. HACE (High Altitude Cerebral Edema): It is also known as the advanced stage of AMS. It affects the individual with worsening condition of AMS which was not treated properly by time.

Due to hypoxia because of low blood pressure at altitudes, there is lack of oxygen supply to the brain resulting in swelling of brain cells causing edema.

Some of the symptoms seen are-

- Ataxia i.e. unable to walk straight
- Pale skin / discoloration
- Blood while coughing
- Dejected (feeling socially withdrawn)

3. HAPE (High Altitude Pulmonary Edema): One faces this sickness because of failure to acclimate on the higher altitude and give excessive of exertion to the body.

It is also characterized as the most deadly and lethal problems of high altitude for the time being. The frequency of this illness is seen in those people who choose to travel in ascending direction, neglecting their minor health deteriorating symptoms.

There is an elevation in the blood pressure, causing lung capillary leakage proceeding in the accumulation of the fluid in lungs resulting in swelling and edema.

Some of the symptoms listed below-

- Breathlessness while performing any task ( in critical condition even while resting)
- Chest pain
- Incessant coughing
- Swelling
- Reduced activity performance
- Discomfort

4. Frostbite: A condition caused by cold exposure of the body in which there is the formation of ice crystals in the tissues also causing injury to the cells contributed by ischemia, anoxia, and acidosis.

Hooda, 2016 highlighted in her study that frostbite are of three types-

- First Degree Frostbite: Affecting the epidermis layer of the skin making skin pale by color.
- Second Degree Frostbite: Affects deeper layers, is superficial causing the skin to look white or blue in color.
- Third Degree Frostbite: In this, there is very deep damage in the underlying layer of the skin & tissues and the condition can be fatal.

5. Chilblains: It affects people who have a lot of exposure to outdoor activities in the cold weather which causes inflammation to the skin. It also results in weight loss, pink or redness of the skin and itchiness.
6. Some other manifestations include Facial edema, Retinal hemorrhages (develops at ranges above 5000m leading in vision impairment), Monge disease which affects residents of high altitude area and the person is shifted to down ranges immediately until further improvement in health is seen (Luks, 2016).

### III. MANAGEMENT OF HIGH ALTITUDE SICKNESS

One can easily diagnose the altitude illness by various symptoms of body e.g. dizziness, tiredness, intense headache, difficulty in breathing, inflammation or itchiness of skin also leading to paleness or redness of the skin.

The body requires a period of time to recover, therefore it becomes mandatory to give rest to the body and descend immediately to evade the severe health consequences. Descending should also be gradual process i.e. 300-600m at once.

One should avoid the intake of Alcohol and smoking Tobacco as it only worsens the conditions by hugely damaging the lungs and respiratory system.

An experimental study conducted by Singh et al, 1997 shows that the taste bud intensity is also getting affected at higher altitudes. In the study, the volunteers were taken to altitude range of 3500m and were tested weekly on the basis of a scorecard scale on their taste threshold & taste intensity. The study concluded that there was an increase in the taste thresholds for glucose and sodium chloride because of the high altitude hypoxic stress one encounters.

According to the study of Dharmananda, 1997 there are following DO's & Don'ts for traveling at higher altitude-

1. Avoiding sudden exertion for speeding up towards higher altitudes as it is one of the biggest cause of AMS.  
Ascending gradually is a logical step one should follow for better health status.

2. Acclimatizing is an essential Aid Adaption i.e. taking a one day rest of not climbing after every three days.
3. It is a safe option to walk up at a higher altitude rather than flying to it.
4. Cutting down heavy activities like exercising and consuming ample amount of water to circumvent the condition of dehydration.
5. Incorporating carbohydrate dense diet is also an important aspect.
6. Descending towards lower altitude if the health is severely deteriorating.

#### IV. DIETARY MANAGEMENT

Staying hydrated is considered to best practice while traveling to elevated areas and cut down the problems like frostbites. A minimum of 4 liters intake is highly recommended and can be taken in forms of energy drinks, salt lemon honey water to boost up the power of body immunity.

Carbohydrate-dense foods are plus addition to diet as it is one of the greatest energy sources in higher altitude. It is advisable to have low-fat foods because they require more energy to get digested in the body, so fatty food should be always taken along carbohydrate diet so that metabolism is easily acquired in the body.

One should eat enough of protein and calorie dense food to stay fit and healthy and adequate amount of vitamins to be the best performer while ascending at higher elevations (Parcell, 2018).

#### V. DRUG TREATMENTS

Despite the preventive measure, one uses for avoiding altitude sickness, they can also be easily treated with the help of drugs/medicines.

Following are the drugs that help in treating illness-

1. Acetazolamide: In a study of Taylor, 2011 shows that the reasonable amount of dosage one can consume for adults is 125 mg twice a day and it can be increased to 250 mg twice a day if the ascending is rapid.
2. Benzodiazepines & Hypnotic medications are often used for reducing insomnia which further heals the irritability and tiredness of an individual. Discontinuation of these medications can result recur in the sleeping problems.
3. Dexamethasone: This drug is used in emergency healing doze for AMS. The recommended intake is 4-6 mg after every six hours.
4. Acetaminophen and Ibuprofen: These medicines are helpful in curing headaches and also treat inflammations of the body. Being an Anti-Inflammatory Drug and an effective painkiller, one can use it as an alternative for Acetazolamide and Dexamethasone.

#### VI. NATURAL HERBS BENEFICIAL FOR ALTITUDE SICKNESS

Justin Cooke, 2016 highlighted few herbs that can heal altitude sickness:

1. Caffeinated herbs- Caffeine being part of xanthine family increases the BMR of the body which is a beneficial factor as it elevates the functioning of the heart and increases the rate of pumping in the body for good oxygen supply.
2. Cordyceps Sinensis- It is considered as a vasodilator that is efficient in providing vigorous growth of red blood cells which increases the hemoglobin level of the body and enhances the performance for higher altitude.
3. Maca- an herbal crop which can be procured at high altitudes above 4000m. The effect is seen more progressive if eaten prior to the days of climbing.
4. Rhodiola- a plant found in the range of 3500m-5000m and plays the equal role like that of cordyceps sinensis by improving the efficiency of athletic performance maintaining good oxygen regulation in the body.

Other herbs include:

Ginkgo Biloba (Maidenhair tree), one of the common herbs used for preventing altitude ailments. There are some studies which do not support the positive impacts of Ginkgo Biloba and show conflicting results. However, there are lot other studies which support the role of this herb in reducing the severity of the altitude sickness and it more of help in cognitive growth by stimulating the brain power of a person.

Herbs like Thea Sinensis (Tea leaves), Zingiber Officinale (Ginger), Cinnamomum cassia (Cinnamon) and Mentha × Piperita (Peppermint) helps in relieving stress, headache and chest pain. It also provides recovery from problems like shortness of breath by improvising the oxygen supply and regulation.

Meena et al., 2010 explained the role of Shilajit herb as quite effective in reducing the hypoxia in the body and a proficient blood regulation as it has a copious amount of flavic acid which also regenerates energy to perform numerous tasks at altitude.

Use of Chinese herbs is also advantageous in remedies as illustrated in the study of Dharmananda, 1997 like Tienchi Ginseng (Sanqi) & Eleuthero Ginseng (Ciwujia) which eliminate the reoccurrence of HAPE in the body.

## VII. HERB AND DRUG INTERACTION

As stated above Altitude sickness can be treated by intake of both herb and drug methods. Although herbs are considered one of the natural practice remedy, one needs to be well aware of the herbal and drug interaction if taken at the same time.

A study of Greener, 2016 shows that Pharmacologists categorize drug-herb interaction by three ways: Pharmaceutical Incompatibility, Pharmacodynamic and Pharmacokinetic Interactions. Few examples are listed below like:

1. Warfarin with Alfalfa, Fenugreek, Ginseng, Green tea & Ginkgo Biloba which causes the high amount of bleeding risk, lowers blood glucose levels and decreases the effectiveness of the medicine.
2. Anticoagulants with Feverfew, Ginger & Garlic results in increase bleeding effects too.
3. Benzodiazepines and Ciclosporin with Echinacea elevate plasma concentrations along with immunity levels.
4. ACE inhibitors and Monoamine oxidase inhibitors with Capsicum affect the provoking of blood pressure levels.
5. The benzodiazepine with St. John's wort roots the cause of weak concentration power and difficult in thinking ability.
6. Acetazolamide with Grapefruit juice results in threatening increase of drug levels in the blood.

## CONCLUSION

Hence the article highlighted the different types of high altitude problems and ways to prevent them through diet, herbal & drug treatments. Also, it can be concluded that certain drugs and herbs help in circumventing the sickness. It is a must to keep in mind the herb and drug interactions if taken at the same time while medicating the health sickness. The overall remedy solution drawn out through natural way is definitely herbal treatments and can be incorporated into diets through various combinations to provide the essential aid adaptation at high altitudes.

## REFERENCES

- [1] Hooda, R. (2016). Altitude Health Problems and their Remedies. *Int J Pharm Sci & Scient Res*, 2(5), 223-229.
- [2] Taylor, A. T. (2011). High-altitude illnesses: physiology, risk factors, prevention, and treatment. *Rambam Maimonides medical journal*, 2(1).
- [3] Greener, M. (2016). The hidden problem of herb-drug interactions. *Prescriber*, 27(9), 22-27.
- [4] Hooda, R. Research and Reviews: Journal of Pharmacognosy and Phytochemistry.
- [5] Leadbetter, G., Keyes, L. E., Maakestad, K. M., Olson, S., van Patot, M. C. T., & Hackett, P. H. (2009). Ginkgo biloba does—and does not—prevent acute mountain sickness. *Wilderness & environmental medicine*, 20(1), 66-71.
- [6] Sartori, C., Allemann, Y., Duplain, H., Lepori, M., Egli, M., Lipp, E., ... & Nicod, P. (2002). Salmeterol for the prevention of high-altitude pulmonary edema. *New England Journal of Medicine*, 346(21), 1631-1636.
- [7] Wangchuk, P. (2009). *High altitude medicinal plants of Bhutan: An illustrated guide for practical use*. Pharmaceutical and Research Unit, Institute of Traditional Medicine Services, Ministry of Health.
- [8] Dharmananda, S. (1997). *Reduction of Mountain Sickness with Chinese Herbs*. ITM.
- [9] Meena, H., Pandey, H. K., Arya, M. C., & Ahmed, Z. (2010). Shilajit: A panacea for high-altitude problems. *International journal of Ayurveda research*, 1(1), 37.
- [10] Singh, S. B., Sharma, A., Yadav, D. K., Verma, S. S., Srivastava, D. N., Sharma, K. N., & Selvamurthy, W. (1997). High altitude effects on human taste intensity and hedonics. *Aviation, space, and environmental medicine*, 68(12), 1123-1128.
- [11] *Benzodiazepines: Uses, Side Effects, Interactions & Warnings*. (2018). *Drugs.com*. Retrieved 13 March 2018, from <https://www.drugs.com/article/benzodiazepines.html#interactions>
- [12] Parcell, S. (2018). *Best Diet for High Altitude*. *NatureMed Boulder | Naturopathic, Holistic, Integrative Medicine*. Retrieved 13 March 2018, from <http://www.naturemedclinic.com/content/best-diet-high-altitude>
- [13] M. Luks, A. (2018). *Altitude Diseases - Injuries; Poisoning - MSD Manual Professional Edition*. *MSD Manual Professional Edition*. Retrieved 8 March 2018, from <http://www.msdmanuals.com/professional/injuries-poisoning/altitude-diseases/altitude-diseases>
- [14] *Acetazolamide (Diamox) - Side Effects, Dosage, Interactions - Drugs*. (2018). *EverydayHealth.com*. Retrieved 8 March 2018, from <https://www.everydayhealth.com/drugs/acetazolamide>
- [15] Schepps, B. (2018). *Fueling Up On The Mountain: How To Eat At High Altitude*. *Liftoptia Blog*. Retrieved 5 March 2018, from <https://blog.liftoptia.com/eat-high-altitude/>