High altitude Headache

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High altitude Headache

- I. High altitude Headache (HAD)
- II. Flight Associated Headache

  1. **Altitude Sickness on Flights**

  2. L**ong-Haul Flights May Promote High-Altitude Symptoms**

  3. High Altitude Flight
- III. Fear of flying
- IV. Case report (Flight Associated Headache)
- V. Discussion

High Altitude Headache (HAH)- ICHD-II

- ICHD-II: 10.1.1. The headache occurs within 24hrs after acute onset of hypoxia with PaO2 less than 70mmHg or in chronically hypoxic p'ts withPao2 persistently at or below this level
- Headache attributed to a disorder of homeostasis: Hypoxia, Hypercapnia, HAH, Diving, Sleep apnea HA, Dialysis, Arterial H/T, Pheochromocytoma, Hypertensive crisis without encephalopathy, Hypertensive encephalopathy. Pre-eclampsis, Eclampsisa, Hypothyroidism, Fasting, Cardiac cephalgia, Other
- C.F of HAH

A: >-2/5of following and fulfilling criteria C/D: 1)Bilateral 2) F or F/T 3) Dull or moderate intensity 4) Aggravated by exertion, movement, straining, coughing or bending

B: Ascent to altitude >2500m

C: Headache develops within 24 hrs after ascent

D: Headache resolves within 8 hrs after descent

HAH

- Significantly in young. Women and people with headache in daily life- Severe HA at altitude. 95% women with greater severity and 82% men. Possible of intracranial hypertension – Awakened on sleep, awakening, exacerbated by bending, coughing, sneezing.
- Onset within 24 hrs of reaching particular height, duration <24hrsAcute mountain sickness (AMS): Rapid ascending to high altitude. Principal symptoms: Mod to severe HA, with nausea, anoxia, fatigue, dizziness and sleep disorder. Extreme case: Acute encephalopathy- ataxia, depressed consciousness, termed high altitude cerebral edema- MRI vasogenic edema.
- Management: 2 days acclimatization before streneuos exercise in high altitude. Avoid alcohol. Over fluid intake. Acetazoleamide (125mg/bid –Tid) reduce AMS, Scanol and NSAIDS. Triptan: migrane at altitude

High Altitude Headache

- **Box 2-3. Tips for acclimatization**
- The following are helpful tips for people traveling to high altitude destinations.
- Ascend gradually, if possible. Try not to go directly from low altitude to >9,000 ft (2,750 m) sleeping altitude in one day.
- Consider using acetazolamide (Diamox) to speed acclimatization if abrupt ascent is unavoidable.
- Avoid alcohol for the first 48 hours.
- Participate in only mild exercise for the first 48 hours.
- Having a high-altitude exposure at >9,000 ft (2,750 m), for 2 nights or more within 30 days prior to the trip is useful.
- Treat an altitude headache with simple analgesics.

High Altitude Headache

- **Clinical Presentation**
- Altitude illness is divided into three syndromes:
- Acute mountain sickness (AMS)
- High-altitude cerebral edema (HACE)
- High-altitude pulmonary edema (HAPE)

High Altitude Headache
Acute Mountain Sickness (AMS)

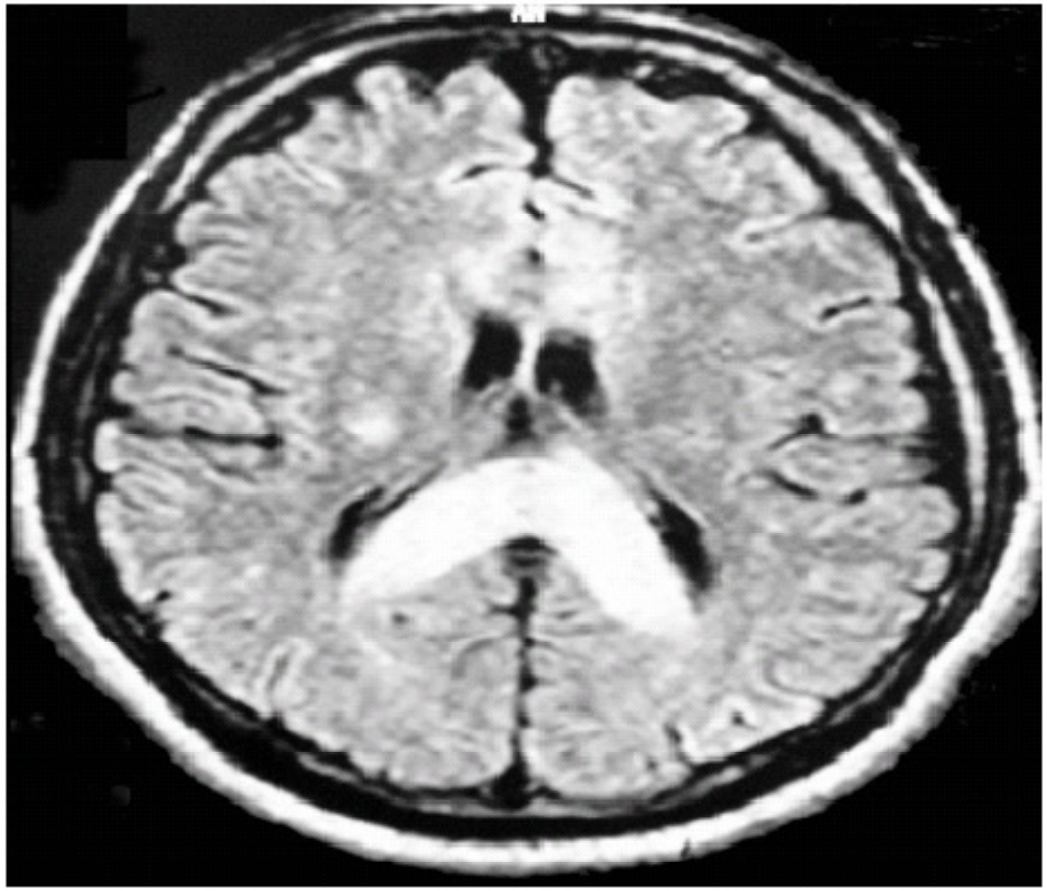
- AMS is the most common form of altitude illness, striking, for example, 25% of all visitors sleeping above 8,000 ft (2,500 m) in Colorado. Symptoms are those of an alcohol hangover: headache is the cardinal symptom, sometimes accompanied by fatigue, loss of appetite, nausea, and, occasionally, vomiting. Headache onset is usually 2–12 hours after arrival at a higher altitude, and often during or after the first night. Preverbal children may develop loss of appetite, irritability, and pallor. AMS generally resolves with 24–72 hours of acclimatization.

High Altitude Headache

High-Altitude Cerebral Edema (HACE)

- HACE is a severe progression of AMS and is rare; it is most often associated with pulmonary edema. In addition to AMS symptoms, lethargy becomes profound, with drowsiness, confusion, and ataxia on tandem gait test. A person with HACE requires immediate descent; death from HACE can ensue within 24 hours of developing ataxia if the person fails to descend.

Figure e40-1

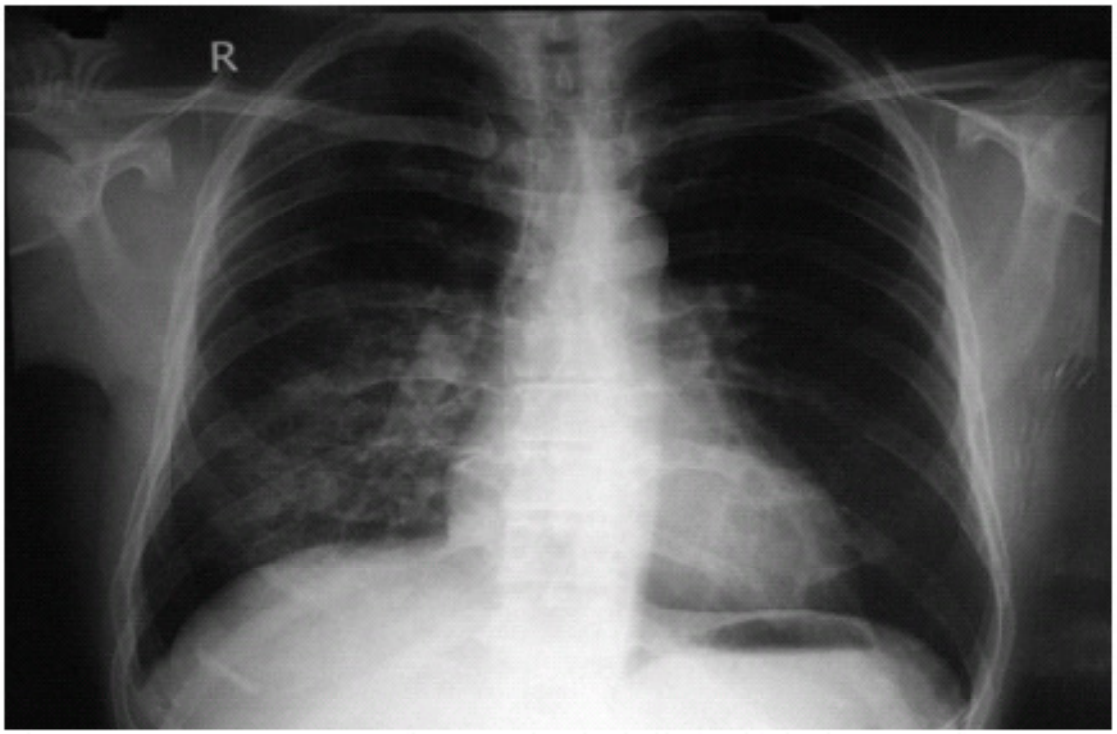


T2 MRI image of the brain of a patient with HACE showing marked swelling and a hyperintense posterior body and splenium of the corpus callosum (area with dense opacity). The patient, a climber, went on to climb Mount Everest about 9 months after this episode of HACE. (*With permission from Wilderness and Environmental Medicine, 15(1): 53-55, Spring 2004.*)

High-Altitude Pulmonary Edema (HAPE)

- HAPE can occur by itself or in conjunction with AMS and HACE; incidence is 1/10,000 skiers in Colorado and up to 1 of 100 climbers at >14,000 ft (4,270 m). Initial symptoms are increased breathlessness with exertion, and eventually increased breathlessness at rest, associated with weakness and cough. Oxygen or descent of 1,000 m or more is life-saving. HAPE can be more rapidly fatal than HACE.

Figure e40-2



Chest radiograph of a patient with HAPE shows opacity in the right mid- and lower zones simulating pneumonic consolidation. The opacity cleared almost completely in 2 days with descent and oxygen.

High Altitude Headache

- **Pre-Existing Medical Problems**
- Travelers with medical conditions, such as heart failure, myocardial ischemia (angina), sickle cell disease, or any form of pulmonary insufficiency, should be advised to consult a physician familiar with high-altitude medical issues before undertaking high-altitude travel.

Treatment of High Altitude Headache

- **Acetazolamide**
- **Dexamethasone**
- **Nifedipine**
- **Other Medications**
- **Tadalafil (Cialis), 10 mg twice a day, during ascent can prevent HAPE and is being studied for treatment. When taken before ascent, gingko biloba, 100–120 mg twice daily, was shown to reduce AMS in adults in some trials, but it was not effective in others, probably due to variation in ingredients. Gingko biloba has not yet been compared directly with acetazolamide.**

Preventive Measures for Travelers-1

The three rules that travelers should be made aware of to prevent death from altitude illness are—

- Know the early symptoms of altitude illness and be willing to acknowledge when they are present.
- Never ascend to sleep at a higher altitude when experiencing symptoms of altitude illness, no matter how minor they seem.
- Descend if the symptoms become worse while resting at the same altitude.

Preventive Measures for Travelers-2

- For most travelers, the best way to avoid altitude illness is by gradual ascent, with extra rest days at intermediate altitudes every 3,000 ft (900 m) or less. If ascent must be rapid, acetazolamide may be used prophylactically, and dexamethasone and pulmonary artery pressure-lowering drugs, such as nifedipine or sildenafil, may be carried for emergencies.

II. Flight Associated Headache-1

Altitude Sickness on Flights (ASF)

Altitude Sickness on Flights (ASF)

- Certain symptoms during air travel are due to altitude sickness. Air pressure inside common passenger aircraft is equivalent to mild altitude exposure.

- People who get symptoms when going to the mountains may get the same headache, tiredness, tachyness, and other symptoms of altitude in flight. Drinking alcohol adds to symptoms. Severity of symptoms depends on several things, mainly how high the altitude, and how fast you reach it.

- Cabin pressure varies with cruising altitude and type of aircraft. During a flight, the inside of a large commercial passenger air flights may range between 5000 to 9000 feet (~1525-2743 meters), occasionally higher or lower. Small lower planes flying may be able to maintain pressures closer to (or equal to) ground pressures.

ASF

- How fast aircraft reach these altitudes depends on the flight path, final cruising altitude, type of aircraft, and other factors. Some of my commercial pilot friends say they will pressurize the cabin far more gradually when they see babies onboard, so that they (the babies) cry less as pressure changes around their ears. Pressure change on the ears is not altitude sickness, just simple air volume change. Earplugs do not prevent this problem, and can make it worse in some situations. Future posts can cover why.

ASF

- Susceptibility to altitude sickness does not seem to be affected by better or lesser physical conditioning, or any kind of fitness or physical training. It is still a hugely interesting topic to understanding how the body reacts to and works at altitude, why certain interventions work or don't, and how soon you can fly after going scuba diving - important to risk of decompression sickness.

  Reader Bill, athlete and pilot, writes, "Regulations require no more than a 10,000 foot cabin altitude (3048m) be maintained for commercial passenger flights. Anyone not acclimatized to altitudes between 7 to 10 thousand feet (~2-3 thousand meters) will feel some symptoms of a mild hypoxia, surely after several hours or/and a couple stiff drinks."

  The next post tells more about altitude sickness on flights and more interesting issues and a few proposed cures - Altitude Sickness, Viagra, and Bubbles on Flights

Flight Associated Headache

- Environmental factors in airplanes may precipitate headaches. We conducted a questionnaire-based study among consecutive travellers to determine the rate, severity and duration of flight-associated headaches (FAHA).
- Of the 906 eligible travellers (mean age 33.3 +- 13.8 years), 22.3% reported headaches at least once per month. FAHA occurred in 52 travellers (5.7%), of whom 34 were women ($P = 0.0023$ vs. none FAHA). The duration of pain was 4.0 10.2 h after takeoff and continued for 5.7 +- 14.2 h after landing.
- Migraine was diagnosed in 19.2% of those with FAHA. The magnitude of headache was 6 +- 2 (on a scale of 1–10). Among those who suffer from FAHA, 45.4% reported that their pain was unilateral, in contrast to 72.7% among those with 'non-flight' headaches ($P = 0.019$). Nine travellers had headaches when descending to -400 m below sea level, and nine upon climbing to high altitude. This preliminary observation indicates that FAHA is not uncommon and should be further investigated.

Cephalalgia, 2008, **28**, 863–867

Flight Associated Headache

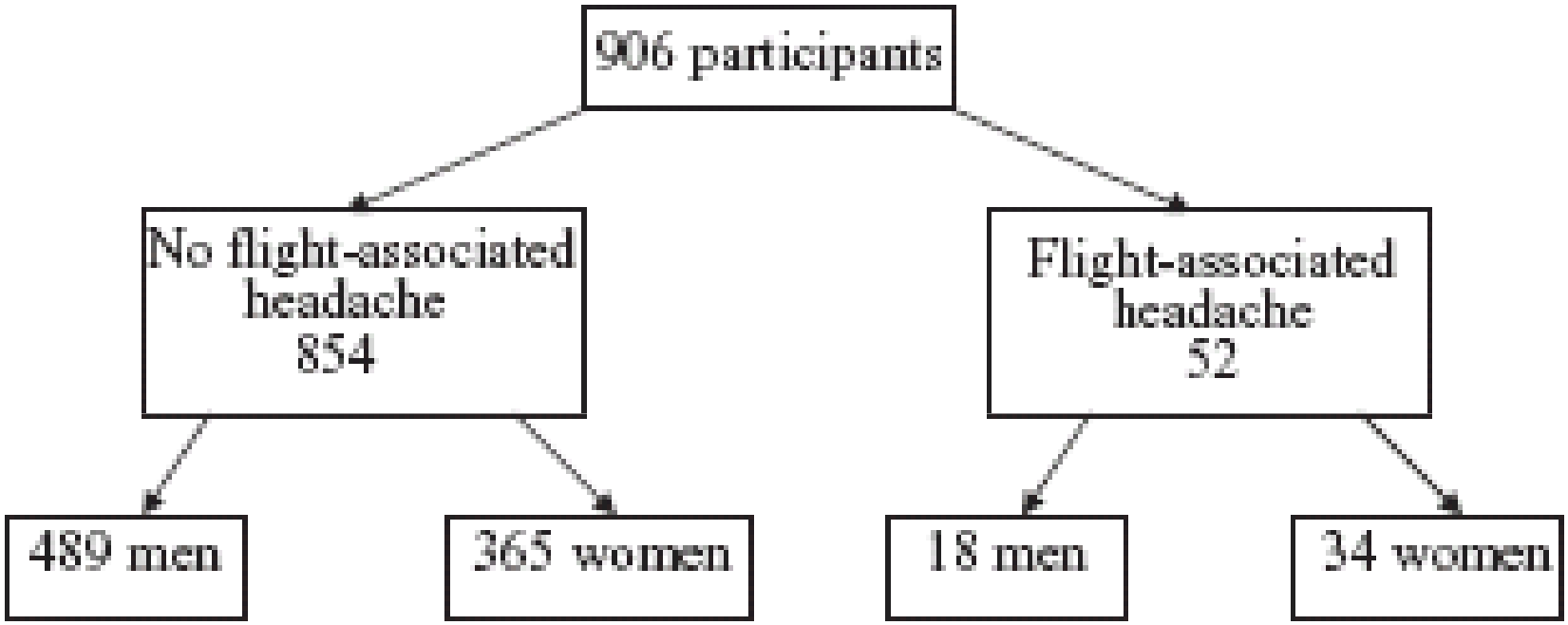


Figure 1 FAHA and gender in eligible travellers. FAHA, flight-associated headache.

Table 1 Characterization of patients with FAHA ($n = 52$)

Feature	Count	Rate, %
Age (mean ± S.D.)	33.3 ± 13.8	
Female gender	34	65.4
Diagnosis of migraine	10	19.2
Headache starts upon		
Landing	21	50.0
Takeoff	19	45.2
Both	2	4.8
Headache on each flight	10/41	24.4
Laterality of headache		
Unilateral	15/33	45.4
Bilateral	18/33	54.5
Type of headache		
Pressure	23/36	63.9
Pounding	10/36	27.7
Both	3/36	8.3
Magnitude of headache (on a scale of 1–10)	6 ± 2	
Additional symptoms		
Nausea	12/27	
Light sensitivity	9/27	
Noise sensitivity	7/27	
Confusion	4/27	

Headache upon descent to the Dead Sea (–400 m)		
No	34/43	79.0
Yes	9/43	21.0
Headache upon ascent	29/38	76.3
to high altitude	9/38	23.7
Headache improved over the years		
No	28/40	70
Yes	12/40	30
Age started	20 ± 8	
Family history		
No	27/40	67.5
Yes	13/40	32.5
Duration of pain (h)		
After takeoff	4.0 ± 10.2 (P = NS)	
After landing	5.7 ± 14.2	
Treatment taken		
Total group	25/52	48
Paracetamol	9	
Dipyrone	7	
Triptans	3	
Combinations	6	

Rates were calculated only for valid responses.
FAHA, flight-associated headache.

Flight Associated Headache-2

Long-Haul Flights May Promote High-Altitude Symptoms

Long-Haul Flights May Promote High-Altitude Symptoms

- Explain to interested patients that high altitude may induce significant discomfort including backache, headache, light-headedness, shortness of breath, and impaired coordination.
- In a study of volunteers in a hypobaric chamber simulating altitudes from 650 to 8,000 feet, ascent from ground level to 8,000 feet was associated with about a 4% drop in oxygen saturation, found J. Michael Muhm, M.D., M.P.H., and colleagues, of the Boeing Company here, and Oklahoma State University in Tulsa.

Long-Haul Flights May Promote High-Altitude Symptoms

- The induced hypoxemia was sufficiently severe to add discomfort to airline passengers already enduring three to nine hours in cramped confines, the authors reported in the July 5 issue of the *New England Journal of Medicine*.

- "On the basis of our findings we conclude that maintaining a cabin altitude of 6,000 feet or lower (equivalent to a barometric pressure of 609 mm Hg or higher) on long-duration commercial flights will reduce the occurrence of discomfort among passengers," they wrote.

Long-Haul Flights May Promote High-Altitude Symptoms

- Commercial airline cabins are typically pressurized to 565 mm Hg or lower, equivalent to a terrestrial altitude of about 8,000 feet, or roughly the altitude of Bogota, Colombia. Mountain sickness may occur among travelers who are not acclimated to altitudes above 6,500 feet. Also known as altitude sickness, the condition is a self-limited syndrome characterized by headache, nausea, vomiting, anorexia, lassitude, and sleep disturbance. The occurrence rises with climbing heights and is related to rapidity of ascent, they wrote.

Long-Haul Flights May Promote High-Altitude Symptoms

- The symptoms of acute mountain sickness are believed to be caused primarily by hypoxia in a hypobaric environment, such as high in the Himalayas, with the severity of symptoms increasing as arterial oxygen saturation drops, the authors noted.
- To see whether similar effects occurred among airline passengers at typical cabin pressures, they conducted a prospective, single-blind, controlled hypobaric-chamber study in 502 volunteers.

Long-Haul Flights May Promote High-Altitude Symptoms

- Tests were conducted under atmospheric pressures equivalent to 650, 4,000, 6,000, 7,000 and 8,000 feet above sea level.
- The participants reported discomfort with responses to the Environmental Symptoms Questionnaire IV.

Long-Haul Flights May Promote High-Altitude Symptoms

- The investigators found that as the altitude went up, mean oxygen saturation went down, to a maximum decrease of 4.4% (95% confidence interval, 3.9% to 4.9%) at 8,000 feet compared with sea level.
- In all, 7.4% of the volunteers suffered from acute mountain sickness, with symptoms such as malaise, muscular discomfort, fatigue, and ear, nose and throat discomfort.
- There were no differences in the frequency of mountain sickness among any of the altitudes studied.
- Exercise reduced the prevalence of muscle discomfort, but did not affect any other symptoms.

Long-Haul Flights May Promote High-Altitude Symptoms

- "The frequency of reported discomfort increased with increasing altitude and decreasing oxygen saturation and was greater at 7,000 to 8,000 feet than at all the lower altitudes combined," they wrote. Post hoc analysis showed that the five nvironmental Symptoms Questionnaire IV symptoms that most contributed to discomfort were backache, headache, light-headedness, shortness of breath, and impaired coordination.
- Volunteers older than 60 were less likely to report discomfort than younger participants, and men were less likely than women to have discomfort.

Long-Haul Flights May Promote High-Altitude Symptoms

- The authors suggested that the reported discomfort "may represent subclinical acute mountain sickness." As they found evidence that the level of hypoxemia manifested at 7,000 to 8,000 feet played an important role in the development of discomfort, they concluded that cabin altitude of 6,000 feet or lower will reduce passengers' discomfort.
- No serious adverse events occurred during testing, but four occurred within one month after testing, one of which, pneumonia, may have been study related.

Long-Haul Flights May Promote High-Altitude Symptoms

- There were 15 additional adverse events during the study, none serious. Nine may have been study related, including painful ear pressure, a panic attack, and low oxygen in an older women at the 8,000 feet level. The authors noted that their study may have underestimated the degree of decline in oxygen saturation, which was greater in two other studies looking at the effects of altitude in commercial airplanes. Additionally because they used a modified version of the Environmental Symptoms Questionnaire IV, their results are not comparable with those of other studies using standard versions of the questionnaire. The study was funded by the Boeing Corporation. The authors are employees of the company.
- "Effect of Aircraft-Cabin Altitude on Passenger Discomfort." *N Engl J Med* 2007;357:18-27.

Flight Associated Headache-3

High Altitude Flight

High Altitude Flight

- **Definitions of High Altitude (as defined by the ISMM):**
- **High Altitude: 1,500 – 3,500 m (5,000 – 11,500 ft)**
- **Very High Altitude: 3,500 – 5,500 m (11,500 – 18,000 ft)**
- **Extreme Altitude: above 5,500 m**
- **1. Altitude sickness rarely occurred below 2,500 m (8,000 ft).**
- **2. The flight altitude is expressed as Flight Levels (FL). For example, 35,000 ft is flight level 350 or FL 350.**

High Altitude Flight

Physiological divisions of the atmosphere:

- **1. Physiological zone: From sea level to 10,000 ft; no oxygen or special protective equipment required; and ear or sinus difficulties begin during rapid ascents or descents.**
- **2. Physiologically deficient zone: From 10,000 ft to above 50,000 ft (FL500); reduced pressure and oxygen deficiency becomes an increasing problem; supplemental oxygen is required when flying above FL100; trapped gas in the gut tract and evolved gas problems; and thermal protection is required.**

High Altitude Flight

Medical Issues:

- **Hypoxia (Oxygen deficiency): Usually acute syndrome, resulting from inadequate oxygenation of tissues secondary to a decreased partial pressure of oxygen in the inspired air.**
- **Hypoxia may aggravate into anoxia (an absence of oxygen supply to an organ's tissues although there is adequate blood flow to the tissue).**

High Altitude Flight

Medical Issues:

- **Hypoxic hypoxia. Specific causes are:**

  A reduced alveolar partial pressure due to reduced atmospheric pressure.
- **Decreased pulmonary ventilation from any cause.**
- **Pneumonia.**
- **Obstruction of air passages by tumors or strangulation.**
- **Admixture of fully oxygenated blood with venous blood.**

High Altitude Flight

Medical Issues:

Factors influencing acute hypoxic hypoxia:

- **High altitude**
- **Rate of ascent**
- **Ambient temperature**
- **Physical activity**
- **Individual factors such as inherent tolerance, physical fitness, emotional state, and acclimatization.**
- **Hypercapnic hypoxia (carbon monoxide uptake among tobacco smokers)**
- **Histotoxic hypoxia (the effects of alcohol)**
- **Stagnant hypoxia (reduced blood flow)**

High Altitude Flight

Medical Issues:

- **Clinical signs and symptoms of hypoxia: Hyperventilation (increased rate of respiration) and depth or both; hypocapnia (decreased carbon dioxide), which leads to respiratory alkalosis (blood is alkaline). The signs and symptoms of hypoxia and anoxia are (NINDS, 2001):**
- **Cyanosis**
- **Mental confusion, hallucination, seizures, memory loss (amnesia)**
- **Poor or impaired judgment and performance (for one to two hours after severe hypoxia)**
- **Loss of muscle coordination ("stiffening", myoclonic jerks, and generalized muscular tetany when partial pressure of carbon dioxide is reduced to 24-30 torr).**

High Altitude Flight

- **Unconsciousness, stupor or comatose**
- **Cerebral tissue euphoria (an exceptional feeling of well being) or belligerence**
- **Air hunger or oxygen wants**
- **A felling of apprehension**
- **Headache**
- **Dizziness**
- **Fatigue**
- **Nausea**
- **Hot and cold flushes**
- **Blurred vision**
- **Tunnel vision**
- **Tingling**
- **Numbness**

High Altitude Flight

Hypothermia:

- **iv. Therefore, based upon the STP at the sea level: 760**

torr and 15oC and a heat loss rate of 2oC with each 1,000 feet of altitude, temperatures, windchill value, and pressures at 18,000 and 25,000 ft will be:

- **Altitude (Ft) Pressure (Torr) Temperature Windchill (kcal/m2hr)Sea level 760 15oC (59oF)**
- **18,000 379.8 -20.6oC(-5.10oF) 550**
- **25,000 282.40 -34.5oC (-30.0oF) 660**

High Altitude Flight

Hypothermia:

- **Less than 5oC causes a series of health hazards during**

  an extended exposure time:
- **Immediate drowning (initial gasp and ensuring uncontrollable hyperventilation)**
- **Cardiac arrhythmia due to peripheral cold shock**
- **Loss of function in chilled hands**
- **Coma due to CNS temperature depression**
- **Death by drowning or hypothermia cardiac arrest.**

High Altitude Flight

- **Signs and symptoms of** Hypothermia
- **Alert and shivering at the core temperature between 90 and 95oF.**
- **Muscular activity decreases when the core temperature falls below 90oF**
- **Lethargic at the core temperature around 85oF**
- **Decreased vital signs at the core temperature around 80oF**
- **Apparent death at the core temperature below 80oF**

III. Fear of flying

Fear of flying

- **The fear of flying has many components, not all of which are specific to flight itself. Some of these components are anxieties about** •Heights•Enclosed spaces•Crowded conditions•Sitting in hot, stale air•Being required to wait passively• Not understanding the reasons for all the strange actions, sounds, and sensations occurring around you•Worrying about the dangers of urbulence•Being dependent on unknown mechanical things to maintain your safety•Being dependent on an unknown pilot's judgment•Not feeling in "control"•The possibility of terrorism

Fear of flying **before seeking treatment you might want to ask yourself several questions**

- **1.What exactly were the circumstances of the flight on which the fear of flying symptoms first appeared?**

  Why were you flying?
  What happened just before the flight?
  What happened during the flight?
  What happened just after the flight?
  (Try to recall the facts, as well as the exact words of anything that was said.)

Treat of Fear of flying

- **Basic Principles of Aircraft: Explains in simple, easily understood language how airplanes fly, what movements and sounds to expect in flight, and what turbulence really is.**
- **FlightAutogenics**
- **TrainingProgressive Muscle**
- **Relaxation**
- **Systematic Desensitization**
- **Hypnosis and Cognitive Psychology**

Case Present

Flight Associated Headache (FAHA)

Case Present (FAHA)

- 2005/8/6: Post concussion brain syndrome MER.
- 08/7/28: Post injury the r't hmeicranial HA since then. r't temporal refrer to occipital. throbbing:+. nausea: +. disability:+. phbobia:noise+. F: 2/M. Predisposing factor: on airplane assocaited.charactor:no changed. stress:not associated. Visual aura with paresthesia+. Minor: 2-3/M

  IMP: post traumatin headcahe. migraine+
- Palpaitation+ chest tighnessepisode. atatck :once/wk. for minuse with smoking. IHD. refer to CV. Treadmil: 13.5METS : no ischemia
- 2010/4/16:PH: r't hemicranial since 3 ys (2004). 2005/8 post hitting trauma by other people. Insomia: one ys(2007)
- 10/4/16: Heightness associated headache during flight. no flight no pain. persisted HA throbbing nausea+ vomitting. +. due to Ha more exacerbated.Suggest admission for MRA with enhence (carotid artery) for R/O intracaranial vascular abnormaly.
- B MRI 2010.6: Frontal sinusitis , no other abnormal finding

Case Discussion

- Post concussion brain syndrome
- Post traumatic headache: migraine

  Migraine was diagnosed in 19.2% of those with FAHA
- Flight associated headache
- Post traumatic headache with Flight associated headache

Take Home Message-1

- I. High altitude Headache (HAD) 24hrs after acute onset of hypoxia with PaO2 less than 70mmHg, Try not to go directly from low altitude to >9,000 ft (2,750 m) sleeping altitude in one day.

Consider using acetazolamide (Diamox) to speed acclimatization if abrupt ascent is unavoidable. Altitude illness: Acute mountain sickness: High-altitude cerebral edema,High-altitude pulmonary edema

Take Home Message-2

- II. Flight Associated Headache

  1. **Altitude Sickness on Flights,** 2. **Long-Haul Flights May Promote High-Altitude Symptoms** 3. High Altitude Flight

  The symptoms of acute mountain sickness are believed to be caused primarily by hypoxia in a hypobaric environment; with the severity of symptoms increasing as arterial oxygen saturation drops; altitude went up, mean oxygen saturation went down. 7,000 to 8,000 feet played an important role in the development of discomfort, they concluded that cabin altitude of 6,000 feet or lower will reduce passengers' discomfort

- III. Fear of flying : Cognitive behavior treatment

Thank you for your attention