The Highest Battlefield of the World : Medical Problems and Solutions

Col AK Jindal, *YSM**

Abstract

The Indian Armed Forces Medical Services has been engaged in providing medical to the soldiers serving on Siachen Glacier for the last 25 years. This paper attempts to highlight the medical problems faced by troops on the world's highest battlefield as perceived by a medical officer located on the forward most medical echelon on Siachen Glacier. The medical problems on the glacier include high altitude pulmonary oedema, acute mountain sickness, frost bite chilblains, hypothermia, snow blindness, injury non enemy action due to avalanches, crevasses and fires, carbon monoxide poisoning and problems in disposal of nightsoil. A large number of problems are taken care of by following a well documented acclimatisation drill. However under such conditions providing medical support is a difficult task and requires innovations and improvisations entailing a high degree of mental mobility on the part of medical commanders and the Regimental Medical Officers located on the forward posts.

MJAFI 2009; 65 : 170-172

Key Words: Siachen; Acclimatization; Extreme high altitude

Introduction

The world's toughest, coldest, highest and bravest battle is being fought on Siachen Glacier for over the last 25 years. This paper attempts to highlight the medical problems faced by troops as perceived by a medical officer located on the forward most medical echelon on Siachen Glacier

Location, Terrain and Climate

Siachen Glacier lies in Northern Ladakh in the Karakoram, a mountain system originating from the Pamirs. This area is the most glaciated area outside the polar region comprising 22 glaciers. Troop deployment on the forward posts is from 18000 ft to 23000 ft. Temperatures dip down to below -55 degrees C and blizzards at 100 to 160 knots are a common phenomenon. In addition the area is crisscrossed by massive crevasses ranging from 40 ft in depth to practically bottomless ones. Besides, the confined glaciers have extremely unstable avalanche prone slopes. This terrain and the enemy shelling, restrict the area in which camps can be sited considerably and soldiers are advised to limit themselves to previously mapped routes only.

Medical Problems

High Altitude Pulmonary Oedema (HAPO): This accounts for most deaths from high- altitude illness. The incidence of high altitude pulmonary oedema is related to the rate of ascent, the altitude reached, individual

susceptibility and exertion, while cold increases pulmonary arterial pressure by means of sympathetic stimulation, which is an additional risk factor [1]. The annual incidence of hospital admission for HAPO in our Armed Forces is as low as 0.15 per thousand soldiers per year [2]. All soldiers prior to induction follow the well documented acclimatisation schedule on the glacier [3]. Majority of the cases of HAPO that take place are seen in those who come back after leave and do not acclimatise. The dictum on the glacier is that one walks up to the post and so automatically gives time to the body to adapt itself physiologically. It may be noted that there is no acclimatisation suggested after the third stage viz 4500 m [3]. Experience shows that once the man completes the three stages he can be even flown from 15000 ft to as high as 22000 ft without developing symptoms of HAPO.

Ideally, a patient of HAPO should be evacuated to lower altitude as early as possible. However, sometimes due to weather conditions helicopter evacuation is not possible. Our forward posts have been equipped with a single man portable hyperbaric chamber HAPO bag that has been developed by Defence Research & Development Organisation (DRDO) using specially developed polyurethane material. It simulates low altitude conditions at extreme altitude conditions [4].

Acute Mountain Sickness: Unlike HAPO, acute mountain sickness (AMS) is a syndrome of non-specific

*ADH & Senior Advisor (PSM) HQ 2 Corps, PIN 908502, C/o 56 APO.

Fig. 1 : Soldiers covering the tough terrain of Siachen Glacier

symptoms and is therefore subjective. The symptoms typically develop within 6 to 10 hours after ascent but could come on as early as one hour [5]. The importance lies in its early recognition as it may progress to high altitude cerebral oedema (HACO) that has a high degree of mortality. The diagnosis could be delayed in case the medical officer is untrained as he mistaken for a case of acute psychosis or even malingering. Due to effective enforcement of the acclimatisation drill, the incidence of AMS in the Indian Army is as low as 0.10 per 1000 soldiers per year [2]. The HAPO bag can prevent mortality due to HACO in case of inclement weather when casualty evacuation is not possible [6].

Effects of Cold : Barry Bearak has described the Siachen Glacier as “a place where rifles must be thawed and machine guns primed with boiling water. Here a relay is setup to exchange frozen rifles with defrosted ones [7].” This aptly sums up the chilling weather conditions prevailing on this Himalayan glacier. Soldiers are bound to suffer from hypothermia, frostbite and chilblains. This could be during the time when a routine patrol loses its way due to a sudden unforeseen blizzard or during active operations when the call of duty prevents a soldier from changing his socks or replacing damaged gloves. The soldier’s own sweat can become his enemy as it becomes ice in his gloves and shoes and frostbite takes its toll on his extremities. Clothing is designed in a manner that it protects the soldier from cold and prevents excessive sweating through proper control of ventilation [8]. The clothing is multilayered (airspace not exceeding 0.9 cm) so that it traps the air and works on the principle of the traditional quilt. It is waterproof and there is an inner water vapour barrier to prevent the diffusion of water vapour into clothing from skin.

Injuries due to Non Enemy Action (NEA): Crevasses are caused where the glaciers take turns on their outer sides and movement of glaciers. These

Fig. 2 : Avalanches can cause havoc in this terrain

crevasses have hard icicles formation at their bottom capable of piercing through the body like a spear and low temperatures of minus 200 degrees and below. Many a soldier has lost his life in them due to hypothermia. Those who are rescued due to abnormally heroic actions have severe spinal cord injuries due to the icicles. The second major cause of injuries is avalanches. The camps have therefore to be sited taking into account avalanche risk which often may compromise tactical requirement. The third cause of injuries is fire. A little bit of carelessness while lighting the fire for the cookhouse or the candle or the bukhari to keep one warm can lead to a massive catastrophe. The entire post can get wiped out as the winds ensure that the fire spreads rapidly and involves all the posts.

Carbon Monoxide Poisoning : Carbon monoxide is a colourless, odourless gas. Cases of poisoning can take place when one lights the bukhari at night in a closed space like a fibreglass hut and goes to sleep. This is particularly dangerous because the symptoms are not immediately apparent. The men inside the tent or the hut will be found dead in the morning in case of severe carbon monoxide poisoning. Orders on the glacier are that regardless of the cold all heating devices will be put off prior to sleeping in any closed space. Lives are lost when these instructions are violated.

Nutrition : All soldiers lose upto 5-10 kilograms of weight during their 3-4 months tenure on the glacier. This is because the body requires more calories in the extreme cold climate to maintain the basal metabolic rate. The calorie requirement could be as high as 4000-5000 K calories per day. A high fibre, high carbohydrate, low salt diet is recommended for such areas. Troops are given special rations that cater to the above requirement. It is ensured that this is tailor-made as per the ethnic and cultural requirements of the deployed soldiers. The troops are given chikki, precooked dal, chapatti, egg, vegetable, rice, etc. These special foods

have been developed by the Defence Food Research Laboratory (DFRL) Mysore especially for soldiers deployed on the glacier. It caters to the fact that as the boiling point of water becomes extremely low at such altitudes, cooking in normal utensils would not help. It may not be possible to use a pressure cooker at these locations. So these precooked foods require to be heated for a short time only in normal vessels for the food to be fit for consumption. Despite this, certain posts are in such forward localities that cooking is just not possible due to high wind speed. These soldiers have their meals airlifted from the lower locations. Anorexia at high altitude coupled with the monotony of tinned food with fresh vegetable being an occasional luxury ensures that despite the best of efforts the soldiers lose weight. To ensure that the food requirements are met as per the cultural factors, the Indian Army ensures that the bulk of the troops employed in an area come from similar background.

A lot of water is to be consumed to avoid dehydration. Under snow conditions, water is always available, through the melting of snow but the limiting factor remains fuel, as the same has to be airdropped or carried manually to forward posts, where air effort is not possible due to enemy action. The procedure followed is to teach the men to conserve fuel. To melt ice over a stove the men start with enough water to cover the bottom of the utensil. When this has melted only then small quantities of more snow are added. Alternatively, the utensil is laced with half a bottle of water after filling it with ice or packed snow.

Disposal of Human Waste : This is a serious problem because maintaining suitable thermal environment at which the microorganisms effecting degradation can survive is difficult. Chemicals are expensive for the amount of faecal matter to be degraded. DRDO has recently developed a method for disposal of human waste in an ecofriendly manner. The technology has two major components, low temperature active inoculum and temperature controlled biodigester [4]. Hopefully, this will sort out the problem of disposal of faecal waste and maintain the environment of this mountaineer's shangrila.

Chain of Evacuation : A separate bunker dug into the snow covered with a corrugated iron sheet serves as a bunker in forward posts where intense shelling takes place. Maintaining an intravenous (IV) lifeline in a simple bunker poses a major problem as the IV line freezes and it is difficult to maintain the same by constantly holding a stove under it. Research is required to maintain

IV fluids at body temperature for infusion in this terrain.

As a rule all evacuation takes place by helicopters. However, on the forward posts where flying is not possible due to enemy action the same is done by stretchers or by snow scooters/ snow vehicles till the helipad.

Acclimatised Reserves for Reinforcement : At times due to heavy casualties during operations reinforcements are to be rushed immediately to defend the posts. These are picked up from low lying areas and dropped on the forward location and most are non acclimatised, with inherent risk of AMS/HAPO. The commanders should maintain adequate reserves at around 15000 ft on any post so that these could be airdropped in case of a crisis.

Conclusion

Operations in the glaciated environment of Siachen have opened a new chapter in the history of modern warfare. Never before has man battled with nature and fought in such extreme conditions. Siachen has turned a new leaf in medical tactical doctrine. Conventional thinking and textbook philosophy do not apply in this unusual environment. Innovations and improvisations entailing a high degree of mental mobility are a must for the successful conduct of operations in such an environment.

Conflicts of Interest

None identified

References

1. Kapoor R, Narula AS, Anand AC. Treatment of Acute Mountain Sickness & High Altitude Pulmonary Oedema. Medical Journal Armed Forces India 2004; 60: 384-7.
2. DGAFMS. Report on the Health of the Armed Forces 2005. New Delhi: Director General Armed Forces Medical Services 2005; 47.
3. DGAFMS. Manual of Health for the Armed Forces 2002, Vol 1. New Delhi: Director General Armed forces Medical Services. Vol 1. New Delhi: Director General Armed Forces Medical Services 2002; 81-2.
4. DRDO. Biomedical Technologies. Technical Focus. New Delhi: Defence Research & Development Organisation 2001; 9: 75-7.
5. Peter HH, Robert CR. High altitude illness. N Engl J Med 2001; 345: 107-13.
6. Rao KS. High Altitude Syndromes & their Management. In: Anand AC, Chief Editor. Textbook of Environmental Emergencies. 1st edition. Pune: AFMC, 2006; 12-23.
7. Kanamma. Gunfight at Glacial Heights [Online]. 1999; Available from: URL: <http://www.rediffdiary.com>.
8. Gaggi AP, Burlon AC, Bagett IFC. A practical system for the description of heat exchange of man with his environment. Science 1941; 94: 928-30.