

Health and Fitness Challenges of Armed Forces in low temperature areas: An Analytical study

Dr. Vinod Chahal

Associate professor

Deptt. of physical Education

Pt. C.L.S. Govt. College, Karnal

Abstract

The Indian Army sends a sizable contingent of soldiers to the western Himalayas each year to ensure the safety of the country and defend our borders. Extreme, intolerable, and very rough weather conditions prevail in certain areas. In these areas, temperatures can drop as low as -35°C to -60°C and altitudes as high as 23000 feet from 8000 feet. These conditions range from intolerable to extremely lethal due to the cold weather, low humidity, and hypoxia. Clothing is crucial in shielding kids from such harsh environmental conditions. Military gear designed for extreme cold should protect wearers from the elements without limiting their ability to move freely or perform well during routine tasks or exceptional missions. The military's medical personnel have a very difficult job because they have to maintain the soldiers' physical and mental health in order for them to perform at their best both in peacetime and during operations. These factors include nutrition, exercise regimens appropriate for the terrain and climate, defence against health problems brought on by hypoxia and the effects of cold, clothing and shelter that takes ergonomics into account, the disposal of human waste, and prompt medical attention and evacuation in the event of illness. This paper provides a general overview of the effects of cold hypoxic environments on the health and performance of Indian troops, measures taken by the Armed Forces to maintain troop health, including psychological factors, and the prevalence of various cold-induced health issues during peace time compared to operational period over the last 20 years.

Introduction

Performance in the military is influenced by a variety of variables that change depending on the task. Guard duty, office work, and other physically undemanding duties may make up the majority of a soldier's service during particular operations. As a result of his absence of a substantial amount of subcutaneous fat insulation or a thick coat of fur, man is fundamentally a tropical mammal. Man's main physiological defence against cold environments consists of either increasing metabolic heat generation, either by shivering or by non-shivering

thermogenesis, or preventing heat loss via the skin by vasoconstriction. When exposed naked to temperatures between 15 and 28 degrees Celsius, these processes often work well to keep the body temperature stable. Naked exposure to these conditions is almost always uncomfortable, and when exposed to near-freezing or sub-zero temperatures, body temperature begins to plummet. Clothing or a warm place to stay are the only defences against such temperatures. The majority of experts concur that man does not naturally acclimatise to cold. All males need protective clothes, shelters, or artificial sources of warmth when exposed to near-freezing or below-freezing conditions, yet reactions of people who are born and raised in naturally cold environments differ from those belonging to tropical or subtropical regions.

Due to concerns over its territorial integrity and national security, India is forced to send a significant number of soldiers to the western Himalayas. With the exception of a few hill tribes, the majority of these troops come from the lowlands and were born and raised in tropical and subtropical regions. In the western Himalayas, they are exposed to severe climatic conditions such as extremely low temperatures, hypobaric hypoxia, extreme aridity, a high level of solar ultraviolet radiation, and strong winds. In addition, the unfriendly and tough terrain causes numerous physical and psychological strains. Because they must ensure that soldiers are healthy and operationally fit in the face of such powerful hostile natural forces, military doctors have a very difficult task. Their main concerns are proper nutrition, exercise regimens appropriate for the terrain and climate, defence against health problems brought on by hypoxia and the cold, clothing and shelter that take ergonomic considerations, disposal of human waste, and prompt medical attention and evacuation in the event of illness.

Environmental characteristics

Himalayas are relatively low temperatures during the winter, which could also reach as low as -60°C in certain places, extremely low humidity all year long, with an average that stays below 25%, and strong winds that can reach 120 knots in some areas, imposing a dangerous wind chill effect.

Acclimatization

Although the Indian Military Forces have developed a successful acclimatisation plan for high altitude hypobaric hypoxia, acclimatisation against cold has not yet been possible. Indian defence experts have made several attempts in the past to deliberately expose subjects to temperatures of 10°C for four hours at a time for 20 days in order to increase their tolerance to cold. Moreover, studies have looked at how individuals respond to the cold by assessing their Cold Induced Vasodilator (CIVD) response. It was assumed that people with poor CIVD were more prone to cold-related injuries. The Military Forces have not widely embraced or utilised these studies.

Protective clothes and shelters are the only effective ways to battle cold in the armed forces nowadays as there is no cold acclimatisation programme.

Cold Protective Clothing

Extreme environment protective apparel comes in two different varieties for members of the armed forces. Troops stationed in locations with average winter temperatures of at least -20°C and no permanent snow cover are given the first version. This outfit consists of wool inner underpants, a wool shirt, wool serge pants, wool jersey, and an anorak-style jacket with hood, as well as wool socks, snow boots, mittens, and impermeable gloves. The ensemble weighs a total of around 6.5 kg. It can provide suitable protection against wind speeds of up to 5 knots and temperatures as low as -15°C for a resting man thanks to its average insulation value of roughly 3.5 Clo. The protective value of the ensemble is increased by physical exercise. The disadvantages include greater weight, which raises the metabolic needs of physical exercise, and cumbersome clothing, which limits natural range, tempo, and style of movement. The outer gloves' design makes it difficult for digits to move with precision. Troops exposed to places that are always covered in snow and temperatures below 20°C are given the second type of ensemble. Along with the inclusion of insulated (down) pants and glare-protective eyewear, the components are comparable to the first ensemble. There is more insulation present than 5 Clo. The lighter-weight boot material and better-designed snow gloves improve mobility. The ensemble weighs almost 7 kg in total. The second ensemble is far more expensive than the first variety. Nonetheless, the bulky design has the same issues with movements as the earlier design. In all types of apparel, the outer gloves must be removed during weapon operations, leaving the hands solely covered by mittens. This increases the possibility of cold-related damage to hands and fingers.

Physical Work Capacity

Depending on the altitude, hypobaric hypoxia at high altitude limits a person's maximum ability for physical work. For people who are not acclimated, the decline has been tentatively calculated to be 70% of sea level values at 10,000 feet and 50% at 18,000 feet. 2 months acclimatisation leads to increase in work capacity to roughly 87% of sea level values at 10,000 feet and 68-70% at 18,000 feet. In comparison to sea level, maximum heart rate is reached at a lower work rate, and subjective muscle tiredness is similarly reported at a lower work rate. Hypoxia is also said to lower cold tolerance by raising the threshold for shivering, presumably as a result of hypoxia-induced vaso-dilatation. On the other hand, exposure to cold diminishes one's ability to perform physical labour since some of the oxygen available is diverted to metabolic (non-shivering) thermogenesis and

is not accessible for such labour. Even walking on snow takes more work in locations that are covered with snow. When compared to walking on the ground, it has been calculated that walking on snow requires three times as much energy. Also, it has been noted that even in physically fit and seasoned mountaineers, the pace of ascent continues to decline with altitude in comparison to equivalent rates at sea level. This makes it evident that in these environments, hypoxia and cold together seriously restrict the physical performance of troops. Under these circumstances, the Armed Forces must maintain the highest level of operational and physical effectiveness. It is obvious that this area cannot be used for intense physical training regimens at sea level. However, it has been demonstrated that putting troops through rigorous physical conditioning before exposing them to high altitudes also improves their physical performance there; previously conditioned troops find it simpler to maintain an ideal operational fitness even with a moderate level of training. A battle school located at a moderate altitude is where the Military Forces' conditioning programme, which lasts another 6-8 weeks, takes place after a hard 6- to 8-week pre-induction training period (6500 feet). Following admission to high altitude, physical maintenance routine is carried out which comprises marches, moderate aerobic and strength training exercises, games and gradient climbing at moderate pace. This plan has produced positive results without having a negative impact on the troops. This was seen during the recent Kargil operations, where Indian troops exhibited a high degree of operational fitness in evicting the enemy infiltration.

Nutrition

Based on metabolic needs and the physical demands of the job, the total daily caloric requirement is estimated to be between 4800 and 5000 calories. This is brought on by the combination of elevated metabolic demand brought on by exposure to the cold and the high metabolic cost of physical activity—even simple ones like walking—caused by steep inclines and soft snow. Anorexia brought on by hypoxia and a change in taste preferences should also be considered. At high altitudes, there is less fat absorption. In the past, all these issues frequently led to weight loss and a decline in physical fitness. Fresh food, veggies, and other necessities were frequently unavailable, which made these issues worse. An over reliance on canned food frequently led to boredom and occasionally to a lack of vital nutrients like vitamin C. Military Forces have made a significant effort to address these issues. Currently, the ration scales have been rationalised in a way that reduces the amount of fat in the diet to less than 15% of total calories, provides more carbohydrates, ensures vitamin supplements, provides an adequate amount of protein supplement commensurate with physical requirements, tries to supply fresh rations as often as possible, and introduces variety to avoid monotony. Results from these actions have been incredibly positive.

Psychological Health

Some of the main causes of psychological stress among soldiers include isolation, boring terrain, constant threat from the outside world and the enemy, and a lack of communication. Also, it has been demonstrated that exposure to hypoxia causes a slight decline in cognition and short-term memory recall, which is totally reversible upon descent to a lower altitude within a few weeks. The main effects of psychological stress have been observed in a smaller number of troops as abnormalities in interpersonal relationships, a propensity for drunkenness, reactive depression, and avoidance of responsibilities. The primary preventive strategy used by the Armed Forces entails encouraging positive group interaction, communication between troops and commanders, taking advantage of recreational facilities when they are available, limiting tenure in such areas, providing frequent communication with family members, including satellite phone facilities, and giving the transient effects of hypoxia a comedic spin to reduce anxiety about them.

Hygiene and Waste Disposal

The troops are encouraged and instructed to maintain the highest level of personal cleanliness, take baths whenever possible, and change clothes frequently, despite the fact that maintaining personal hygiene is difficult due to the extreme cold, a lack of water supply, and improper sanitary facilities. They must also maintain the highest level of cleanliness in their immediate surroundings and housing. It is recommended to wash personal items as regularly as possible. These actions have produced positive outcomes, and the incidence of non-radiation skin diseases among these soldiers is even lower than that of the similar population in other regions of the nation.

Human waste disposal is a major issue in cold, snowy areas. The main issue is that digging a trench in deep snow often makes it impossible to reach the ground. Biodegradation of trash is prevented by extremely cold temperatures. Additional garbage, which does not degrade through biodegradation, is also buried in the snow for disposal. The troops must practise "Cat's Hygiene" during operations, in which each man digs a little hole in the snow, relieves himself inside of it, and then covers the waste with snow. During the snow melt season, all the trash spills out, creating a terrible annoyance and a significant health risk. The Armed Forces are considering using mobile chemical closets to solve this issue.

Among the actions being taken are:

1. Thorough health education of troops, including man-to-man training and informational brochures outlining precautions against ailments brought on by the cold

2. Improved shelters and protective clothes.
3. Give any cold injuries prompt medical attention to preserve life and limb.
4. Studying more effective methods for preventing and treating cold injuries.

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