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Is the Cold Friend or Enemy for Soldiers in Military Action?

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Abstract: Cold has impact to every person as on allied forces as well on enemy forces. The topicality of the study is based on the analysis of the experience of military campaigns in cold environments in the history of war and the emphasis on the importance of preventive measures that reduce the influence of low temperature as a natural environmental factor on the tactical readiness of troops. The aim of the study was analyses of cold environment impact on outcome (personnel losses) of military campaign in historical aspect, characterized the main health problems of personnel. We provided theoretical analysis of military campaigns` from ancient time till nowadays. Results of our study showed that realisation of preventative measures as well as planning and providing troops` activities in low temperature environment is one of the greatest challenges for leaders and commanders of military operations; in case of failure environmental factors played crucial role to wars` outcomes, battles` results and could lead to great disaster for military units and armies. The most important conclusion is the temperature of surrounding condition is one of essential factor for combatant's survival, for activity of the personnel in low temperature surrounding, for combat capacity of military personnel and military unit. Timely identification of low-air temperature environment hazard slop down personnel losses in warfare. The most important conclusion stressed that assessment of cold weather, prevent and manage cold injuries allow keep combat capacity and fulfil the mission. Results of our study shown significance the effective program of military force health protection that included adequate logistic as well with nutritional supply. Commander authority in management personnel readiness is essential, physical preparedness, practical skills, and training of personnel in cold environment were important in pre-mission phase of campaign. Research results shown that cold (low temperature) impact as environmental risk factor must be identified and carefully assessed before military action.

Keywords: cold environment, cold injuries, preventive measure planning.

Introduction

The aim of the study was analyses of cold environment impact on outcome of military campaign in historical aspect. The low temperature as environmental factor played crucial role in wars outcomes, battles` results and could led to great disaster for military troops and armies (Pandolf et al., 2001). Human body is complicated biological system where various physiological, biochemical processes take place; the surrounding environment, low temperature could induce cold-weather injuries, that endanger physical health, working and combat capacity, and also recognize the danger of cold weather on activities of personnel in military environment, and operations (Burr, 1993). The low temperature forms general impact on physical health (hypothermia) as well local impact/ damage on periphery regions like foot, hands, ears, noise (Abel et al., 2006). The cold induces freezing and non-freezing injuries. One of the most common freezing cold injuries is frostbite that characterized with freezing all layers of skin as well muscle and bone; the frostnip is the first degree of frostbite, that characterized with superficial freezing of the skin and is a result of contact with cold object, or chilblain or trench foot. The immersion foot or trench foot is a non-freezing injury in wet environment that characterized with peripheral vascular disorders, damage of blood vessels and nerves, and as a consequence the other tissues (Sullivan-Kwantes et al., 2021). The lowering of physical health has negative effect on physical abilities and combat capacity of military personnel (Daanen et al., 2016). Factors that increased the risk of cold injuries in winter operations could divided into individual and common. There are numerous individual factors like old age, exhaustion, inadequate nutrition, tobacco-use, alcohol-use, dehydration, previous cold injuries poor hygiene inadequate or wet clothing, wet boots, constricting boots, chronic diseases etc. The common factors connected to commander authority: failure of preventing measure program, inadequate supply, deplete logistic, lack of training etc (Zwaag et al., 2022).

Methodology

The analysis of the influence of the cold environment on the outcome of the military campaign in a historical aspect was carried out by conducting a theoretical analysis of the outcome of the wars and the outcome of the battles that led to a major disaster for military units and armies in the history of wars. The main tasks were to investigate and describe the cold weather assessment performed or not performed for the prevention and management of cold injuries that would allow for the maintenance of combat capacity and successful mission execution.

Results and Discussion

Overview of experience warfare in ancient history done by Robert Pozos (2001) shown that the greatest epidemics of cold injury have occurred during Cyrus campaign into Asia Minor. At the Battle of Cunaxa (401 BCE), not far from Babylon, the Greeks won, and Cyrus was killed. Xenophon (434–355 BCE) was a young Athenian officer in an army of mixed Greek mercenaries, he was elected in position of the new leaders and became the main inspiration and driving force for troops. He conducted mountain campaign, he led 10.000 men on a 1.000-mile retreat through the mountains (now the territory of Armenia), in the depths of the winter of 401/400 BCE. The troops had extreme cold exposure, only 4,000 soldiers survived; most of the others died from exposure the cold and frostbite by Cyrus on a campaign into Asia Minor.

The low temperature is a factor that had influence the outcome of wars and battles in previous centuries as well the cold as a natural environmental factor has been one of the greatest challenges for forces in modern time. The cold (low temperature) as the environmental risk factor needs identification and assessment before military action. The low temperature form general impact on physical health (hypothermia) as well local impact/ damage on periphery regions foot, hands, ears, noise) as cold injuries (frostbite or chilblain or trench foot). The lowering of physical health has negative effect on physical abilities and combat capacity of military personnel (Roberto et al.,2001).

Overview of experience of battles in northern Italy in 218 BCE against Roman done by Robert Pozos (2001) shown that the famous Carthaginian general, Hannibal, during the campaign led army of 38.000 infantry, 9.000 cavalry, and 80 elephants to the valley of the Rhone. The troops made the passage of the Alps in heavy snow had already fallen in the mountain valleys across the Alps. The extreme weather bitter cold, altitude provided dangerous impact to the forces, only 19.000 men survived, the half-starved and frozen. Cold weather decided the fate of armies, common and severe cold-weather injuries often caused the deaths of hundreds of thousands of soldiers, confounding plans, and turning victory into defeat. The lessons from historical experience of warfare shown that success of tactical operation depends on management of preparedness military personnel and appropriate surveillance and preventive measures for health support. Military operation is the challenge for military personnel in cold environment, when the temperature slop down below +4°C, especially if the duration of tactical operation is prolonged. The lessons learned from history shown that the low temperature has influence of physical health capacities and physical fitness the military personnel and was the leading and crucial factors in tactical operations. Failure to prevent cold injuries, incorrect decision of commanders concerning management, insufficient logistic, lack of theoretical knowledges and practical skill of survival in cold environment degraded personnel performance, result impermanent incapacity or death of soldiers, and have disastrous impact on mission.

Experience of the Great Northern War connected to Sweden King Charles XII, the Swedish troops leader activities in Norway. He decided to give battle in autumn 1718 against Norwegians, but he was killed at the beginning of invade at the beginning of December 1718. After that the main body of army in short time retreat and the northern part of army when it crossed highest ridge during severe storm in northern Norway lost half of man (3.700) died from hypothermia and frostbite (Godley, 1928)

The American war history shown action of General George Washington and Valley Forge during the winter 1777/1778, he led army with 11.000 men, troops had inadequate clothing and boots for wintertime, 2.000 men were without boot. There were severe medical problems of cold injury during the cold time with snow and temperature below freezing in valley Forge (Meier, 1991).

Overview of Napoleon campaign in Russia done by P. Segur in 1958, nominated it as one of the largest disasters in war history when the cold weather destroyed army. The campaign was planned as short-term invasion with one decisive battle. Napoleon army had logistic department that planned supplies, prepared of depots, formed transportation battalions. Commander did not account the winter weather condition during preparation phase. The Napoleon army reduced from 612.000 men in June 1812 till 110.000 men in October 1812. Decision of Napoleon to stared started force retreatment in October 1812 led to army failure. Weather conditions with temperature fallen above freezing, wet and snow, heavy rain, and after that bitter cold (-40°C) had dangerous effect on troops. The low temperature factors did not consider and did not control by commanders, cold weather degraded human performance and led to incapacitation and death of soldiers. Napoleon troops force sloped down till 50.000 men in one month later, prolonged impact of humidity, snow and cold weather decreased army capacity. The retreated Napoleon`s troops on their road met with natural obstacles as rivers and swamps, destroyed villages and towns there were no shelters, nutritional supply. Prolonged exposure of cold weather mud afflicted combatants by combination of cold injuries, as trench foot and as well frostbite. There were no exact data about numbers of cold injuries, soldiers suffered from wounds, that combined with cold exposure and health complaints. Napoleons` army had 100.000 men killed, 200.000 soldiers died from various cases, 50.000 casualties were in hospital, about 50.000 men deserted, and 100.000 were prisoners of war. Russian army personnel losses were about 250.000 casualties, who had wounds with combination of cold effect (Segur, 1958).

Preventive measures and health support of forces in cold environment should rest upon experience, practical skills, and knowledge. In the case of minimal support and depleted logistic and nutritional, troops morally degraded and lost their combat performance capacity. Commanders should assess preparedness of units for action in wintertime. The personnel should be trained to survive and continue military actions, but the personnel losses in such situation could be high. Preventive measures for combat health support should carry out and control before military action. Lessons from war history shown prolonged cold environment harmful impact on soldiers' health status and military campaign. Prolonged exposure of cold and wet are known when the temperature is above 0° C are known as non-freezing cold injury (trench foot or immersion foot), but when temperature is extreme low the cold caused on the periphery tissues of limbs, freezing cold injury (frostbites). These injuries combined to general cold exposure – hypothermia.

The non-freezing cold injuries are known for centuries in military actions, the Crimean war (1853-1856) between Osman impair and Great Britain, France from one side and Russia from another side shown harmful effect of low temperature and humidity of physical health, trench foot or immersion foot (Whitaker, 2016). The thousands of cold injuries (the trench foot) in British and French troops decreased combat fitness of troops. Logistic problems aggravated personnel loss; during the one winter season were fixed about 1.942 cold casualties in 50.000 men large army (Francis,1984).

The 1st World War is known as a trench warfare, soldiers spent weeks and months in trenches when the low temperature near freeze and humidity formed harmful effect of physical health. Exposure of cold and wet are known when the temperature is above 0° C are known as non-freezing cold injury (trench foot or immersion foot) but when temperature is extreme low the cold caused on the periphery tissues of limbs freezing cold injury (frostbites). These injuries combined to general cold exposure - hypothermia. Overview of experience warfare of the 1st World War shown British army reports that contained data about 115.000 cold injuries in four months of 1914/1915 (Gilbert, 1994). Extended cold, wet and low food supply, non-adequate clothes, and non-effective military equipment in low temperature surrounding were consequences of cold as aggravated environmental factor, that had impact on each side involved in war conflict. The health problems concern periphery part of the body (trench foot) as well on whole body (hypothermia). Low temperature has influence on combat capacity of troops. The question "Is the cold is ally or opponent in combat field? stay open. Russian side reported about 12.000 casualties with severe cold injuries and frostbites. Soldiers were unprepared and unequipped for cold weather. Even trained and prepared troops as Italian mountains troops had cold injuries – Italian authorities informed about 300 cases of cold injuries in mountains region during one campaign (Gilbert,1994). Lessons from 1st World War history shown prolonged cold weather exposure harmful impact on soldiers' health status in time of extended military campaign.

Cold weather exposure threat was reported from experience of the 2nd World War, that started on September 1939, at first it was planned as short military action, with conclusion in two months, but its duration extended till May 1945 with extremely high numbers casualties and dead as from injuries as well cold injuries, from both sides there were about 10 million were cold injuries, German side spread information about 250.000 casualties with cold injuries (Killian,1981). American side as well had large numbers of losses from cold injuries during first winter of their participance in 2nd World War. The Russian- Finnish war shown unpreparedness of Russian troops to struggle in winter condition, clothes and equipment were inadequate to use in low temperature environment, the numbers of losses from cold injuries during Russian-Finnish campaign were about 200.000 (Glantz et al.,1955).

The worse-case scenario shown the German military operation Barbarossa in winter 1941- 1942 with heavy losses of personnel and equipment, that indicated on unpreparedness of troops to extreme cold weather (Clark, 1965). The troops were inexperienced, were not equipped enough for battles activities in cold environment. Depleted logistic and lack of winter clothes for soldiers, low level of food provision in aggravated situation led to struggle with natural factors as well, and consequences of winter military actions were exhaustion of personnel and extremely large number of casualties in combination with cold injuries. Statistics on numbers of casualties were correlated with temperature outside, winter weather conditions, battle activities, action, as well logistic and supplies problems. Military technic (weapons) as well were affected by extreme cold. Lessons learn from experience shown that the troops needed adequate training in cold environment, proper equipment and nutrition, good discipline, and commander's awareness (weather, terrain, battle).

In nowadays military activity of troops in winter is a special kind of operation. US Army, Finland, Sweden have specialized troops that have been trained according had field manuals, transfer knowledges, in military schools and units to disseminate and transfer knowledges know-how. Articles, field manuals, conducted classes educational films, tests, as well development of equipment for actions in cold environment allow to prepare troops, protect troops against cold effect improve soldiers' skills and quality to fighting in cold un with cold.

The experience from war history shown that the meteorological factors, low temperature played crucial role and provided large influence on health status and mobility level of combat personnel, on troops` technical equipment, terrain, statement the roads (Burr, 1993; Francis, 1984). The winter weather conditions characterized by high humidity, formation of mud and aggravation of road status. The weather conditions in wintertime with the sub-zero temperature need special preparedness for personnel as well for technic, machines (engine, hydraulic fluids, fuel filters, water separator heater etc (Taylor,1992; Rav-Acha et al., 2004).

Lessons learn from warfare shown that, cold environment is a challenge for military operation. Combat tasks could be delayed due decreased physical abilities, low manoeuvre capacity of personnel. The troops needed additional clothes, equipment, food supply and logistic support, these factors had impact on military operation. Disregarding of cold environmental factors during preparation phase of military campaign could have disastrous influence on troops capability incapacitation or death of personnel (Heil et al., 2016).

Preventive measures for force health protection are extremely essential. Military personnel should have basically knowledge and practical skill how to survive and keep combat fitness in cold environment. In the case of minimal support, depleted logistic and inadequate supply, the risk of cold weather injuries for personnel increased (Lee et al., 2004; Oksa et al., 2006). The personnel losses in such situation could be high. The personnel should be trained to survive and continue military actions. Prepared equipment and adaptation military tactical activities to cold environment could form health support. Commanders' responsibility is to provide cold environment risk assessment, surveillance and managing prevention and control program for training and preparedness of personnel for action in low temperature weather.

Conclusions

Lessons from the history of war clearly demonstrated the harmful effects of long-term cold environments on the health of soldiers and the failure of military campaigns. Prolonged exposure of cold and wet with sub-zero temperature are known as non-freezing cold injury (trench foot or immersion foot), but when temperature is extreme low the cold caused on the periphery tissues of limbs freezing cold injury

(frostbites). These injuries combined to general cold exposure – hypothermia. War in wintertime need special preparedness, knowledges, practical skills. Non-experienced young soldiers had higher risk to get cold injuries then the soldiers from experienced older troops. Preventive measures for combat health support should carry out and control before military action. Commanders' responsibility is provided risk assessment in cold environment that included analyses of temperatures fluctuation intervals, personal equipment that include clothes, boots etc, and unit equipment, logistic support (shelters, nutrition, and individual health psychological status). One of the preventive measures to protect troops in cold weather is training with assessment of skills and experience in cold to keep combat capacities. All these components form force health support program.

Soldiers` individual cold protection depended on age, physical preparedness and fitness, body composition, alcohol and tobacco-use, dehydration and water consumption, depleted nutrition, low caloric intake, as well health status, chronic diseases, previous cold injuries skills, experience. Adequate individuals' equipment – clothes should protect body from heat losses, wind, and humidity. Essential for each soldier are to have knowledge about cold weather injuries (frostbites) that need active medical intervention, self-protection. The situational risk factors are low mobility, water immersion, constricting boots, wet clothes, and socks. Ignoring and disregarding of cold environment risks lead to cold injuries and illnesses that have disastrous effect to mission performance and could provoke failure of military operation.

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