

Environmental Health Risk Factors Occurring in the Hot Climate, in Warfare Zone

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Abstract

For several years, many countries located in the hot climate areas, mainly on the Asian and African continents, have been carrying on incessant armed conflicts which are being prevented by the use peace or stabilization forces. Difficult sanitary and epidemiological conditions of the regions, where the military and civilian personnel of the mission are located, are a cause of many contagious and parasitic diseases. Other elements which affect the incidence of diseases and traumas are cultural distinctness of the region and people as well as military service in the warfare zone. In connection with the participation of thousands of soldiers and civilians in the missions of international organizations, there is necessity to keep the many people who work in the tropics, in warfare zone, fully informed about the health threats occurring in these areas.

Keywords: health risk factors, hot climate, warfare zone

Introduction

There are many environmental factors that affect the incidence of diseases and traumas in the hot climate area, in warfare zone. Among them are numbered the high temperature and the humidity of the air which can cause heat injuries, intensification of chronic diseases and clinical symptoms of diseases so far in the asymptomatic stages [1]. The cultural differences of the region and people and the duty in the warfare zone cause traumas, stress, and also the excessive use of alcohol and drugs [2]. Low sanitary and epidemiological conditions in the mission area cause the occurrence of contagious, parasitic and sexually transmitted diseases [3].

A knowledge of existing threats is needed to enable adequate prophylactic actions to be taken for the benefit of the people working in different regions of the world. The epidemiological analysis concerning the incidence of diseases and traumas among the mission population

gives a wide range of information required for taking essential decisions concerning medical, hygienic and epidemiological protection. The aim of this article is to illustrate the main health risk factors which can affect the personnel of the peace or stabilization mission in a hot climate, in a combat zone. Information about existing health problems can be used for more effective assessment of the strength and measures of the medical service required to protect the military and civilian personnel of the mission and the aspect of the selection of medical personnel, medical supplies and equipment, diagnostic facilities and treatment of diseases and traumas occurring among the population of people deployed in the hot climate, in the area of operations.

Heat Injuries

Health problems related to high temperature are caused by the loss of thermal balance system which defines the relationship of warmth produced in the human body as a result

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of metabolism and heat from surroundings and the loss of heat from the organism [4]. The thermal balance depends on many factors which are split into the factors which increase the thermal load of the organism and factors that reduce it. The factors that increase the load include solar radiation, high humidity, and lack of air motion, as well as insufficient perspiration, inappropriate clothing, fever, high metabolism and a deficiency of water in the organism. On the other hand, the factors reducing the thermal load are radiation, conduction and transmission of heat (they are effective only when the temperature of the human body is higher than the temperature of the surrounding), sweating (the effectiveness of sweating decreases along with an increase of air humidity) [5]. Only a healthy man and his healthy skin can make heat exchange in the right way, because good health status, good skin care and a healthy life style play an essential role in the conditions of life and work. From a medical point of view, while qualifying the candidates for work in the tropics, it is necessary to remember that people advanced in years, with circulatory and urinary system insufficiency, exudation disturbances, metabolic diseases, obesity, alcoholism, drug addiction or hormonal disturbances have problems with the thermal balance system [6].

The most frequent heat injuries are heat stroke, sunstroke, heat exhaustion and heat cramps [7]. The heat stroke is an acute thermal balance disturbance caused by body overheating, and associated with central nervous system and circulatory system disturbances. High temperature and air humidity are conducive to heat stroke. The direct reason for the illness is exhaustion of mechanisms which regulate the thermal activity and perspiration. Physical activity, inappropriate clothing, an inadequate supply of water and salts and internal factors cause defection of the thermal balance and lead to the onset of heat stroke. Sunstroke occurs as a result of exposure to solar radiation, mainly infra-red rays on the skull cap. This kind of insulation causes congestion of the cerebra-spinal meninx and brain, which results in the formation of meningeal symptoms. So, in order to avoid direct exposure, it is strictly advisable to wear a head cover. Sun stroke and heat stroke can appear at the same time in the hot climate. The clinical symptoms and environment, where a sick person is staying, are most important factors in correct diagnosis. Heat exhaustion is a pathological syndrome related to disturbances of the system caused by an inability to adapt to a stay in raised temperature conditions. It is characterized by dehydration and the loss of electrolytes (mainly sodium and chlorine) and the failure of peripheral circulation, which can lead to collapse. Heat cramps are painful cramps of the skeletal muscles caused by excessive loss of electrolytes through perspiration [8].

Chronic Diseases

As a result of a not very careful selection of the candidates for work in the tropics, very often the military or civilian personnel living in the hot climate area suffer from

not only acute illnesses but also intensification of chronic diseases. Although health contraindications for duty work in the hot climate are clearly described, there are still a significant number of soldiers and civilian workers who have health problems and chronic diseases and for medical reasons should not be there [9]. This is intensified in cases of chronic diseases, especially when the rules of hygienic style of living are not obeyed, resulting in an intensification of many diseases, such as arterial hypertension, coronary heart disease, peptic ulcer disease or nephrolithiasis [10]. Symptoms of diseases very often appear because of a change of climatic conditions and they have been asymptomatic until this time. It is necessary to remember that infections and invasions of pathological factors on a given terrain have also an influence on the course of existence and an increase of new chronic illnesses [11,12].

Stress

An extremely unfavorable environmental factor that influences the health status of personnel working in a foreign country is stress, which is related to staying in a region of a military conflict. In warfare, there is an overlap of other stressors, such as hard climatic conditions, the foreign language of the local people which hinders easy communication, different customs, religion and the style of living, all of which can cause an alienation of the population. Another factor can be separation from family and the awareness of threats from local fauna and flora. Other stressors are a result of official relationships (conflicts with superiors or subordinates, impossibility to manage duties) and beside official relationships (differences in age, education, outlook) which occur in any given community [3,13]. According to many authors, the struggle with stress is one of the basic tasks of the medical service of military contingents serving in these missions [14]. It is estimated that the untreated phase of acute stress moves on to a chronic form which finds expression in psychosomatic disturbances, depressive reactions and changes of personality [15]. Experience has proved that in extreme situations a percentage of the mission members are incapable of adapting to new conditions and have to be evacuated to their home country because of medical reasons [16].

Alcohol & Drugs

The overuse of alcohol and drugs is inseparably combined with the concept of stress. The personnel leaving for work in the mission area also consists of individuals who had problems with addictions before departure. These people are an essential factor which destabilizes work and, what is worse, they have an influence on the other members of the mission who also begin using stimulants. The states of intoxication often lead to various accidents (transport, accidents with weapon or fights). The overuse of alcohol as a consequence causes states of frustration, a reduction in morale and discipline. The dis-

respect of obligatory rules of life and work in the tropics accompanies join with this to cause the increase of disease incidence. It always requires a determined action from the side of the health service and superiors [17]. Problems related to alcohol abuse were observed in the United Nations Interim Force in Lebanon. The most often cases of acute gastrointestinal disorders among Polish peacekeepers hospitalized in the UNIFIL Hospital were from alcohol intoxication [3]. While qualifying candidates for departure to the tropics, it is vital to eliminate people being susceptible to the overuse of alcohol because in the new, difficult environmental conditions their health status usually gets worse [1].

Low Hygiene & Sanitary Conditions

Work in the structures of international organizations in the world are realized in various environments and climatic zones. It is connected with a specific epidemiological and sanitary situation. Most of peace and stabilization missions in the contemporary world take place in the countries having a tropical or subtropical climate, where there is warfare. A low hygiene level and difficult sanitary conditions in destroyed areas, massive migration of people and famine are a risk of an outbreak of various epidemic diseases [18]. The spread of endemic contagious and parasitic diseases in the hot climate is characterized by an increase of expansiveness in the rural areas and the existence of practically untouched ecological niches which are occupied by a given invasive factor or its transmitter. Because of this, the population of rural areas and the personnel of military contingents quartered in the same surroundings are the subject of various kinds of contagious enzootic factors transmitted by animals, insects and from person to person [19]. In rural areas there often occur cases of parasitic invasions free living forms of worms (*Necator americanus*, *Ancylostoma duodenale*) and vegetative forms of protozoa (*Entamoeba histolytica*) [3]. The increase of the incidence of contagious and parasitic diseases in the hot climate is strictly related to the disrespect of advice in the field of compliance of personal hygiene, feeding and accommodation rules. In every month of stay in the tropics about 30-50% of all personnel have diarrhea, about 1% people report episodes of fever connected usually with respiratory tract infections; 0.3% people return from the tropics with viral hepatitis type A; 0.08% with asymptomatic viral hepatitis type B and 0.02% with symptomatic viral hepatitis type B [3].

Infectious Diseases

Diarrheas

The most common diseases in tropical conditions are bacterial, viral and protozoan diarrheas. A stay in the

countries of the hot climate area, mainly in Africa, South-Eastern Asia, Middle East, Central and South America leads to the higher risk of diarrhea incidence [12]. Among the etiological factors of diarrheas, the most frequent are entero-toxigenic strains of *Escherichia coli*. These pathogenic microorganisms secrete scathing factors which cause an appearance of symptoms similar to dysentery and even serious haemolytic-uremic complex [19]. In differential diagnostics of chronic diarrheas protozoan etiology should be considered. 10% of diarrhea symptoms cause intestinal viruses and in 20% of cases, the etiology of diarrheas is unknown. One needs also to pay attention to the possibility of occurrence of diarrheas caused by bacterial pathogens (salmonellosis, shigellosis) which are dangerous etiological factors for ease of the epidemic spreading of the above mentioned contagious diseases. Their spreading is first of all related to a high percentage of carriers of pathogenic strains of intestinal microorganisms among the local population [3].

Intestinal Helminthiasis

The most frequent etiological factors are *Ascaris lumbrico-ides*, *Strongyloides stercoralis*, *Ancylostoma duodenale* and *Trichiuris trichiura*. The parasitic infections of the gastrointestinal tract affect more than 25% of the world population. It is estimated that about 1 billion people are infected with ascariasis, which is the most frequent helminthiasis of gastrointestinal tract in the world. The second according to number of infections after ascariasis is ancylostomiasis. About 500 million people in the world are infected with trichuriasis and taeniasis. Also enterobiasis is of great epidemiological importance. The parasitic diseases of gastrointestinal tract are often caused by many parasites. The most frequent multiple infestations are infections caused by ascariasis, taeniasis and trichuriasis [20].

Intestinal Protozoan Infections

The parasitic diseases of gastrointestinal tract that are an essential epidemiological problem in the world include amebiasis and giardiasis [21]. Amebiasis caused by protozoan *Entamoeba histolytica* is common among the population of the Central America, the Middle East, South-Eastern Asia and Western Africa. The frequency of occurrence depends on the local sanitary conditions and hygiene habits of the population. In North America and Europe, the invasion of parasite appears among 1% of population. It is estimated that *Entamoeba histolytica* invasion concerns about 10% of the world population and the number of deaths is about 30 thousand per year [20]. Giardiasis is a parasitic disease caused by protozoan *Giardia intestinalis*. It concerns from 5 to even 60% of the world population, mainly in the tropical and subtropical zone [23, 22, 25].

Malaria

The parasitic disease, that to a large extent threatens health and life of people in the world, is malaria. It is caused by one of the four species of protozoan *Plasmodium* (*vivax*, *ovale*, *malariae*, *falciparum*). According to the World Health Organization, people from 89 countries in the world are menaced by malaria. The highest range is the form of disease caused by *Plasmodium vivax*, whereas the tropical malaria, called malignant and caused by *Plasmodium falciparum* is limited mainly between the tropics of Capricorn and Cancer, in Equatorial Africa, some countries of South America (Brazil, Peru) and in South-Eastern Asia [23]. The tropical malaria is the most dangerous form of the disease and it causes 95% of all deaths. In recent years, the increase of mortality because of malaria is perceptible. It is connected mainly with the appearance of medicine resistance of *Plasmodium falciparum* to the so far used chemotherapeutics. It is estimated that 300-500 million people suffer from malaria annually and almost 3 million die of it (1 million of children under 5 years old among them). The risk of morbidity concerns about 40% of the world population. Man is the only reservoir of the parasite. The carriers of *Plasmodium* are females of mosquitoes of species *Anopheles*. A mosquito sucks human blood of the sick people through a proboscis intake organ and at this time gets infected by ingestion of gametocytes of *Plasmodium*. After that, the infected mosquito injects to blood sporozoites by prickling a man's skin which starts the parasitic process [21].

Leishmaniasis

Leishmanianis is a parasitic disease of skin, mucous membranes or internal organs (visceral form, *kala-azar*) caused by the protozoan *Leishmania*. The disease occurs in all continents, except for Australia. The number subjected to morbidity is estimated at 350 million people (according to CDC in 88 countries of the world), 12 million people who become ill annually and 1,5 million new cases of the disease every year (90% of cases are of the cutaneous form) [24]. The serious epidemiological problem of cutaneous leishmaniasis occurs in the Middle East. Among American soldiers in Iraq in the period March 2003 – March 2004 653 cases of CL were confirmed but American epidemiologists suspect that number of sick soldiers was much more higher [25].

Viral hepatitis

In the tropics, the infections caused by viruses, mainly hepatitis type A and B play a vital role in the epidemiology of contagious diseases [20]. Although in the recent years the amount of these infections considerably decreased after the introduction of immunization, however they are still a significant epidemiological problem. It is

estimated that about 5% of the world population carry the hepatitis B virus, and among them there are reported 25% serious diseases of liver, e.g. chronic hepatitis, cirrhosis or original cancer of this organ. The Hepatitis B infection causes more than 1 million of deaths in the world every year. The occurrence of this disease is running at 0.2% to even 8-20% of the world population [26].

AIDS

Since the 80's, infections of human immunodeficiency virus (HIV) being a cause of the acquired immunodeficiency syndrome (AIDS) have become a serious threat for the health of the world population. The African epidemic of HIV/AIDS disseminated quickly mainly because of backwardness of the local health service and a lack of financial resources for the disease prophylaxis, detection and isolation of sick people and carriers. A decade later the pandemic of HIV/AIDS surrounded South-Eastern Asia [27]. To date HIV infections have been reported in more than 100 countries in the world. During the first years of the pandemic there dominated infections among homosexuals and bisexuals. These people are still the largest infected group in North and South America, Western Europe and Australia [23]. In Africa the infections are spread mainly by heterosexual contacts and the main source of the infection are prostitutes. In some African cities 30% of the prostitutes are HIV-positive. The second region having a high increase of HIV infections are the countries of South and South-Eastern Asia. In Thailand the percentage of the infected prostitutes oscillates between 49% and 68% [28]. At present, the countries of the former Soviet Union are characterized as the area with a sudden increase of HIV/AIDS infections. At the end of 1995 there were 420 000 carriers and sick people and in 2000 already 700 thousand. In 2000 only in Russia appeared 250 thousand new infections. The majority took place among men, mainly drug addicted. According to the Joint United Nations Program on HIV/AIDS, until the end of 2001 lived 40 million HIV carriers or people having AIDS in the world. In connection with a common appearance this disease, the risk of infection is not conditioned by a geographical location, but such risk factors as casual sexual contacts, blood transfusions without examination of blood for the existence of HIV virus and intravenous using of drugs [26].

Other STDs

Among the sexually transmitted diseases (excluding AIDS), the most frequent are gonorrhoea, syphilis, Chlamydia infections and trichomoniasis. The annual world morbidity on gonorrhoea is estimated at 62 million cases, syphilis – 12 million, Chlamydia infections – 89 million and trichomoniasis – 170 million. The incidence of the STDs in the world is divided irregularly. The highest mor-

bidity occurs in South-Eastern Asia, Africa and Central America [28]. Most of STDs cases appear in the developing countries where gonorrhea and Chlamydia infections are a main cause of infertility in women. On the other hand, in the majority of the developed countries in recent years show a distinct decrease of syphilis, gonorrhea and Chlamydia cases but a still high incidence of viral STDs, mainly herpes genitalis and condylomata acuminata is observed [29]. The morbidity on sexually transmitted diseases among the military and civilian personnel in the warfare zone is several times bigger than during peacetime. The main reason for people undertaking sexually contacts is due to the role it plays in recovery from stress. The stress factors are warfare, separation from family and hard, different climatic conditions [30]. These factors cause penchants for alcohol abuse and casual contacts with prostitutes [31]. Except for the cosmopolitan diseases, like syphilis, gonorrhea, and condylomata acuminata there also appear venereal diseases, characteristic for the hot climate. The most frequent endemic infections are inguinal venereal lympho-granuloma, granuloma inguinale, chancroid [29].

Skin Diseases

A separate problem in the tropics concerns skin diseases which can have an endemic character. Many cosmopolitan dermatoses in the hot climate are of special importance for the sake of their frequent reoccurrence and the escalation of changes [32]. A research program conducted in a hot, humid climate revealed that among Polish members of the United Nations peace mission in Cambodia in the 90's, most health problems were posed by dermatological diseases. Among them dominated tinea, especially tinea of groins (40% of cases) and feet (45% of cases) [13]. Pyodermas, especially furunculosis and ecthymas were also a serious problem. Skin diseases pose epidemiological problems also in hot, dry climates, but their intensification is less than in a humid one [33].

Traumas

During work in peace or stabilization missions various traumas very often take place. A trauma is "an event serious enough for an examined person to be hospitalized or to given help in an emergency care unit". According to the WHO, 75 million people in the world sustain injuries every year. 23% of trauma casualties die or sustain lasting detriment to health. Traffic accidents dominate 40%, where casualties sustain very often complex injuries plurilocular and multiorgan, lead to fast complications (one of the most, high mortality rated is sepsis) [35]. The traffic accidents make up a dominating cause of opened fractures. Other reasons for an increase in the number of patients surgical and orthopedic wards are industrial ac-

cidents, sports traumas, falls, injuries sustained in agriculture work, during fights, and also gunshot wounds. In the hot climate a very important threat comes from poisonous reptiles. It is necessary to pay attention also to venomous arthropods, especially scorpions, spiders and scolopendras [1]. An important group comprises injuries caused by war traumas. According to German authors, the most frequent injuries during the warfare on the military missions area are gunshot wounds (from firearms, mainly AK 47 Kalashnikov) and shrapnel wounds (from shells and antipersonnel mines) [36].

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