

# Epidemiology of Illnesses and Injuries in Specific Climatic and Sanitary Conditions on the Example of Troops Deployed to Military Operations.\* (Part Two)

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## RESUME

### Epidémiologie des maladies et des blessures des soldats déployés lors des opérations militaires.

*Les opérations militaires contemporaines, singulièrement au Moyen Orient et en Asie Centrale ont eu lieu dans des conditions climatiques difficiles et dans un environnement sanitaire souvent inhabituel pour des soldats habitués à vivre en Europe en climat tempéré. Les différences extrêmes de température entre le jour et la nuit ainsi que les mauvaises conditions d'hygiène liées à la guerre ont entraîné de nombreux cas de blessures et de maladies non seulement dans la population locale mais aussi parmi les soldats déployés qui représentaient la population réceptive. Alors que certaines opérations de maintien de la paix comme celles des Nations Unies au Liban et sur les hauteurs du Golan ont été menées dans une ambiance géopolitique relativement stable, les opérations de stabilisation qui sont en réalité des activités de guerre, en Irak et en Afghanistan se classent sans aucun doute parmi les actions militaires les plus dangereuses. Les problèmes sanitaires posant les plus de problèmes dans la zone des combats sont les maladies vectorielles, à transmission hydrique et alimentaire, les maladies respiratoires ainsi que les maladies sexuellement transmissibles, les zoonoses, les blessures liées ou non aux combats y compris les accidents de circulation et de sport. Un risque considérable est aussi constitué par les troubles psychiatriques qui peuvent apparaître immédiatement à la suite d'un événement traumatique dans la zone des combats ou de manière plus indirecte avec un espace de temps. En plus des blessures, maladies et troubles énumérés, les conditions environnementales comme les changements climatiques importants et la faune locale peuvent constituer un risque. Cet article passe en revue les problèmes de santé les plus fréquents survenant parmi le personnel des opérations de maintien de la paix ou des missions de stabilisation dans le contexte des conflits armés en cours.*

**KEYWORDS:** Injuries, Illnesses, Soldiers, Military operations.

**MOTS-CLÉS :** Blessures, Maladies, Soldats, Opérations militaires.

The first part of this article was published in the previous issue: Vol 86/1 - March 2013.

## SKIN DISEASES

The majority of stabilization missions in the world have been executed in hot climate areas, which in connection

with poor sanitary and living standards facilitate the occurrence of various skin diseases which in turn result in the growth of morbidity among soldiers, mainly treated on an outpatient basis<sup>134, 135</sup>. Allergic, bacterial and viral diseases as well as mycoses prevail among dermatoses<sup>136, 137</sup>. There is a close correlation between maintaining personal hygiene and the occurrence of dermatological problems, which is clearly evident



among participants of military operations who are all equally provided with sanitary fittings and cleaning products (soap, washing powder, toothpaste). However, the broadly understood concept of hygiene is interpreted in a number of different ways and it frequently leaves a lot to be desired<sup>138</sup>. Appropriate uniforms and underwear are also essential and need to be adapted to prevalent climatic conditions. The point is not only that the dress code need to be observed by soldiers themselves, but more importantly, that appropriate clothing and footwear, ordered by the military administration, need to be supplied<sup>138</sup>. The fact that the first rotation of the Polish Military Contingent were sent to Iraq equipped with footwear with cracking soles, polyester T-shirts and uniforms tailored to climatic conditions prevailing in Poland rather than in the Middle East attracted widespread attention. A large number of cosmopolitan skin diseases, which in moderate climate areas do not represent a serious health hazard, in tropical areas, due to intensification of changes, frequently result in sick absenteeism<sup>139</sup>. Also, it must be taken into account that health condition of soldiers suffering from allergic dermatoses gets worse in hot climate areas. Clinical observation indicates that persons with positive history of allergies, i.e. patients with photodermatoses, complain of allergic diseases in sunlit areas more frequently<sup>136</sup>. Phototoxic and photoallergic reactions resulting from associated effects of sunshine and products such as medications and cosmetics are particularly widespread in tropical and subtropical areas<sup>140</sup>. In addition to this, contact dermatitis caused by exposure to chemical products (oil and lubricant) belongs to a group of frequently occurring dermatological diseases in the regions of ongoing military operations in hot climate areas<sup>141</sup>. The individual research conducted in the population of the Polish Military Contingents deployed in Iraq and Afghanistan indicated that skin diseases, with allergic dermatoses as the prevailing ones, belonged to a group of the most frequently occurring health problems among patients treated on an outpatient basis<sup>142</sup>.

## ENVIRONMENTAL FACTORS

Military service in peacekeeping and stabilization missions is burdened with a number of adverse environmental factors such as high or low temperatures, wind, sand, dust as well as local fauna. During the summer heat injuries pose a serious health hazard. Also, sand and dust storms become extremely bothering. In the winter exposure to low temperatures becomes a serious health problem. In countries such as Afghanistan, mountain conditions turn out to be an additional threat, especially during the winter when there is much snowfall.

### 1. Heat injuries

A commonly occurring health hazard among soldiers executing mandatory tasks in hot climate areas are heat injuries. They represent a wide spectrum of symptoms of moderately serious intensification in the course of diseases such as heat exhaustion and heat cramps, to life-threatening condition such as heat stroke or rhabdomyolysis<sup>143</sup>.

Initial symptoms of a heat stroke are typically abrupt. In cases of extensive dehydration, continuation of extreme exertion or delayed medical intervention it may turn out to be life-threatening<sup>144</sup>. Heat injuries typically concern physically fit young people<sup>145, 146</sup>. According to Porter, soldiers are more likely to suffer from heat injuries than marathon runners<sup>147</sup>. Manual labor, heat accumulation, thermoregulation (sweating, metabolic processes and action of cardiovascular system) may cause dehydration, dyselectrolytaemia, dysfunction of a number of body systems and organs. Soldiers who have not undergone the acclimatization process run the highest risk of suffering from heat injuries among all military personnel executing tasks in hot climate areas<sup>148</sup>. In the summer of 2003 6,000 soldiers of the Coalition Forces underwent the acclimatization process in northern Kuwait before having been relocated to Iraq (operation *Iraqi Freedom*). With average temperatures reaching + 46°C heat injuries occurred in 50 out of 1,000 soldiers within 10-14 days<sup>149</sup>. The number of heat injuries among soldiers decreases significantly if accurate prophylactic action is implemented. The preventive measures should include consumption of a specific amount of water and electrolytes, and defining specific duration and intensification of physical effort depending on the type of work performed. Also, it is essential to define the risk factors which facilitate the occurrence of health problems mentioned above such as old age, taking medicines (especially anticholinergic and psychotropic), obesity, skin diseases or former episodes of heat injuries in the past<sup>150, 151</sup>. Normally, it takes at least 10-14 days for a representative of a moderate climate to fully adjust to weather conditions prevailing in hot climate areas. The rise of internal temperature in a human body above the rest level is observed in areas where climatic conditions facilitate heat accumulation in a human body (high temperatures and humidity, a lot of sunlight). Heat is eliminated from a human body by means of physical thermoregulation mechanism (hemangiectasia, growth in cutaneous blood flow, increased activity of sweat glands, sweat evaporation). A human body uses the mechanism of thermoregulation to adapt to a wide range of external temperatures. However, it remains sensitive to internal temperatures. Body temperature +/- 2-3°C may result in serious pathological conditions including death<sup>152, 153</sup>. The most commonly occurring heat injuries are: heat stroke, sunstroke, heat exhaustion and heat convulsions. Heat stroke is an acute disorder which occurs as a result of hyperthermia caused by prolonged exposure to high temperatures proceeding with disorders of the cardiovascular and the central nervous systems. Apart from high temperatures the occurrence of a heat stroke is facilitated by high humidity. Direct reason for the incidence of a heat stroke is exhaustion of the mechanism regulating heat and sweating processes.

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\* Presented at the 2<sup>nd</sup> ICMM Pan European Congress on Military Medicine, Amsterdam, The Netherlands, 4-8 June 2012.

VOL.  
86/2



The occurrence of a heat stroke is further determined by exertion, badly chosen clothing, inadequate demand for water and salt as well as internal factors which impair thermal equilibrium. A heat stroke results from direct exposure to sunlight, especially to infrared rays onto a skull cap. This type of radiation causes congestion of cerebrospinal meninges and brain which in consequence leads to meningeal signs. Therefore, in areas where insolation is particularly high it is crucial to wear headgear. Heat exhaustion is a disease which occurs when heat-regulating mechanisms of the body become unable to effectively deal with the heat. It is characterized by dehydration and loss of electrolytes (mainly sodium and chlorine) as well as failure of peripheral circulation, which eventually may lead to a collapse. Heat convulsions are associated with painful contraction of the skeletal muscles resulting from excessive loss of electrolytes while sweating. Heat injuries pose a significant problem in NATO armies executing mandatory tasks all over the world. Among the U.S. Army personnel 5,246 persons were hospitalized due to heat injuries (37 of whom died) in the course of a training process or while conducting military operations from 1980 to 2002. Within the given period the morbidity rate of heat exhaustion decreased, whereas the rate of a heat stroke rose<sup>154</sup>. The incidence of heat injuries was significantly lower in the population of Afro-Americans and Latin Americans than in the population of white Americans (0.76), and it was much higher in the population of white Americans coming from northern states than the ones living in southern states (1.69). Females were hospitalized more often (1.18). Retrospective studies conducted in the British Field Hospital in southern Iraq from 2003 to 2004 revealed that heat injuries accounted for 15.7% of all hospitalizations (n = 4,870) within the first 12 months of the operation Iraqi Freedom. Pathological changes typically occurred within the first several days after their deployment into an operational zone, largely due to hastily conducted acclimatization process<sup>155</sup>. Until now heat injuries resulted in 5 fatalities among soldiers of the Stabilization Forces deployed in Iraq<sup>156</sup>. Furthermore, military service in hot climate areas is not only the question of increased incidence of heat injuries but also the exacerbation of chronic diseases such as arterial hypertension, coronary heart disease, ulcer disease or nephrolithiasis. Commonly, deployment in hot climate areas results in the occurrence of diseases whose earlier process had been asymptomatic.

## 2. Wind, sand, dust

A distinctive feature of hot and dry climate, which prevails in Iraq, Afghanistan and Chad, are much distressing sand and dust storms which predominate in the summer. The effects of wind, sand and dust are often eye, skin, and respiratory tract diseases. Dry air and wind desiccate oral and nasal mucosa leading to nose-bleed, dry cough, lips inflammation. Parts of the body where sand and dust accumulates (ears, armpits and groin) are prone to irritation or inflammation<sup>41, 157</sup>.

## 3. Local fauna

The occurrence of arthropods and reptiles is widespread in hot climate areas. Among the former scorpions, spiders,

solpugids and centipedes prevail. The latter are represented by three snake families: Elapidae, Viperidae, and Crotalidae<sup>80, 158</sup>. Normally, venom of the existing arthropods is not deadly for humans. Solpugids bites happen fairly often (camel spider), and although their venom is not deadly, it may result in some serious body injury. However, a snake bite might be life-threatening. Its venom is typically a compound of two types of protein (neurotoxin and hemotoxin) which induce characteristic clinical symptoms. If hemotoxin predominates, the venom is said to have a hemotoxic effect, in that case it attacks blood cells and damage vessels, muscular tissue and skin, which in turn leads to necrosis at the spot of the bite, shock and in serious cases to death. Venom of some snakes, i.e. Indian cobra occurring in eastern Afghanistan, exhibits markedly neurotoxic effects. It strongly affects the nervous system and results in disorders of the heart muscle action and the respiratory tract, which eventually leads to death<sup>159</sup>. Surveys conducted among 3,265 American soldiers serving in Iraq and Afghanistan from January 2005 until May 2006 demonstrated that 9 persons were bitten by snakes (4.9 cases out of 10,000 patients treated on a monthly basis), whereas 85 persons were bitten by either scorpions or spiders (46.1 cases out of 10,000 patients/monthly)<sup>160</sup>. The individual research revealed that 4 soldiers of the U.S. Forces were hospitalized in the U.S. Army General Hospital in Bagram, Afghanistan due to arthropod bites (spiders, scorpions) from July 2002 to September 2005. Cases of snake bites were not registered. Within the same period 4 Afghans were hospitalized due to bites of venomous snakes. No fatalities were registered.

## 4. Low temperature injuries

Health problems connected to the effects of low temperatures rarely occur in the majority of countries where hot climate prevails. However, in countries such as Afghanistan (during the winter) they may lead to health or life-threatening conditions such as hypothermia, frostbite, chilblains, trench foot or dehydration<sup>161, 162</sup>. Factors which facilitate the occurrence of the above-mentioned diseases are first of all climatic conditions (ambient temperature, speed of wind, humidity, altitude), body injuries related to the effects of low temperatures, wrong diet, drinking alcohol or coffee (dehydrating effect), increased sweating, too much exposure to the cold, poor fitness, inaccurate clothing and equipment. Hypothermia occurs when body temperature drops below 35°C. Symptoms of the disease are typically shivers, drowsiness, stupefaction, hyper excitability, confusion, slow and unclear speech, visual disturbances. If the person is entering critical condition pulse and respiration rates decrease, the patient loses consciousness. If the person is not provided with medical help, death occurs. Frostbites occur at the temperature below 0°C, in mild conditions it only affects skin, but if the disease proceeds to more severe stages damage occurs in subcutaneous, muscular and bone tissue. The constriction of blood vessels leading to circulatory disturbances typically result in frostbites of peripheral parts of the body such as fingers, toes, ears, nose, cheeks. Chilblains is a superficial dermatitis, with



no damage to body tissue, which generally occurs at temperatures 0-15°C, high humidity and long, repeated exposure to severe weather conditions. Chilblains may develop in just several hours, and the damage usually involves peripheral parts of the body. Trench foot is a medical condition caused by prolonged exposure to low temperatures (0-10°C) in connection with damp or wet conditions (more than 12 hours). Pathological changes typically occur during floods. Damage may also occur if a person sweats a lot but has no chance to dry out the skin (feet in boots, hands in gloves). Dehydration is an excessive loss of water and electrolytes which disturbs natural processes of a human body. During the Second World War 91,000 cases of injuries being the effect of low temperatures occurred among American soldiers fighting in all continents<sup>163</sup>. During the Korean conflict 6,300 cases of body injuries caused by the effects of low temperatures were diagnosed among soldiers of the U.S. Army and the U.S. Marines. The prevailing injury was frostbitten feet<sup>163</sup>. In contemporary armed conflicts the risk of the occurrence of such injuries has decreased considerably due to advanced technology of footwear and uniforms. However, expertise in the field of existing risks is essential as far as the implementation of appropriate preventive measures is concerned.

## 5. Mountains conditions

The UN designated the year 2002 as the year of mountains, thus emphasizing the fact that 23 out of 27 military conflicts conducted nowadays take place in high-mountain areas<sup>164</sup>. An example of such a hot spot is undeniably Afghanistan. Mandatory tasks of the military operation conducted in the territory of Afghanistan are usually carried out at altitudes of 2,000-3,000 meters. Therefore inhabitants of lowland countries, such as Poland, need to undergo a well-planned acclimatization process. Also, they need to acquire basic knowledge of existing hazards which occur in high-mountain areas. Health problems of persons staying at high altitudes can be divided as follows: low temperature injuries (which have already been mentioned), diseases caused by hypobarism, hypoxia, and injuries induced by prolonged exposure to the sun<sup>165</sup>. At high altitudes, especially in the winter, the occurrence of such injuries is the result of environmental factors in relation to physiology of a person positioned in a given environment. Normally, temperature drops at higher altitudes, on average, by 2°C every 300 meters. Apart from this, cloudless sky as well as dry and diluted air causes fluctuations in temperature due to intense solar radiation during the day and rapid loss of heat during the night. Hypobarism and hypoxia result in a wide range of diseases - from pathological changes of moderate intensification to life-threatening conditions. The degree of intensification depends on the altitude (at higher altitudes the pressure drops and there is less oxygen in the air), time of exposure (hours, days, months) and the speed of climb and descent. Intensity of effort, psycho-motor condition, age and co-existing health problems may also induce pathological changes in high-mountain areas. Acute mountain sickness (AMS) is likely to occur in each person who has climbed

to a high altitude (more than 1 800 meters) within a short period of time (fewer than 24 hours) and has stayed there for several or more hours. AMS relates both to people who have climbed from lowland areas to higher altitudes within a short period of time and those who being at high altitudes ascended to higher ones. Thus, the cause of altitude sickness is not high altitude itself but rather covering long distances (ascend or descend) within a short period of time. The first signs of AMS may be cerebral or pulmonary edema (HAPE, HACE); however, the majority of cases develop without clear symptoms suggesting the development of a full clinical picture. Other pathological changes which occur due to hypoxia or hypobarism include: peripheral edema, retinopathy, thromboembolism, sub-acute mountain sickness, suppression of immune system, slow wound healing<sup>165</sup>. Additionally, owing to the increased emission of UV rays and reflexion of sunlight from snow, ice and rocks there exists high probability of body injuries resulting from the effects of the sun radiation. An increased UV radiation is caused by its decreased filtration through diluted air. The intensity of UV radiation increases, on average, by 4% every 300 meters. As a result, at the altitude of 4 300 meters UV radiation is 55% higher than at a sea level. Snow and ice reflect 75% of the UV rays, which is especially dangerous on glaciers, where radiation is particularly high<sup>166</sup>.

## TRAUMATIC PROFILE

Contemporary military operations are at risk from criminal or terrorist attacks. Bombings or ambushes with the use of fire-arms occur virtually each day. As a result, a great number of shrapnel and gunshot wounds dominate the traumatic profile among soldiers deployed in both countries. Mines and unexploded ordnance - the remnants of bygone wars - pose an additional threat in Afghanistan. Yet, it needs to be remembered that the execution of mandatory tasks by the Coalition Forces is not only the question of battle injuries. Non-battle injuries, e.g. traffic accidents, misuse of arms or sports injuries, are also widespread in the population of soldiers serving in military contingents. The incidence of non-battle injuries together with battle injuries negatively affects combat efficiency of armed forces and dominates the traumatic profile in areas of military operation.

### 1. Non-battle injuries

Non-battle injuries have always constituted one of the major health problems among soldiers in all military conflicts ever. During the Vietnamese conflict they represented the biggest cause of sanitary losses in the U.S. Forces<sup>167</sup>. During the *Desert Storm* operation they resulted in 81% of all fatalities (being the result of traffic and aircraft accidents) and 25% of all hospitalizations<sup>168</sup>. Injuries of musculoskeletal system (fractures, sprains and dislocations) represented the major cause of all hospitalizations among 21,655 soldiers of the Coalition Forces participating in the operation *Desert Storm*, whereas battle-injuries only constituted less than 5% of all hospitalizations within the same period of time<sup>168</sup>. Examination of American soldiers taking



part in operations *Iraqi* and *Enduring Freedom* from 2003 to 2004 revealed the occurrence of non-battle injuries in 34.7% of peacekeepers (77% of patients required medical assistance)<sup>4</sup>. Despite advanced technology employed by armed forces nowadays non-battle injuries are widespread and frequently affect combat capacities of units in a negative way. The percentage of non-battle injuries might be even higher than quoted in official statistics as the data is frequently based on records of medical evacuations and hospitalizations of patients, whereas a large number of non-battle traumas are taken care of at level 1. and 2. of medical evacuation on the outpatient basis<sup>169</sup>. There are no major differences as to the occurrence of non-battle injuries among U.S. Forces deployed in Iraq and Afghanistan. The most common cause of such traumas are sports injuries (workout, sporting competitions, gym) and traffic accidents which take place while carrying out mandatory tasks<sup>170</sup>. The survey conducted among 13,861 soldiers of the U.S. Army hospitalized due to sports injuries demonstrated that sprains or dislocations of musculoskeletal system accounted for 82% of all traumas. Injuries of a knee-joint and its sacral ligament occurred most frequently<sup>171</sup>. In males sports injuries typically occurred while playing American football or basketball, whereas in females during workout or playing basketball. Traffic accidents occurring in combat zones frequently result in injuries or fatalities, which is largely due to disastrous condition of roads and drivers' ignorance of traffic regulations<sup>172</sup>. The research conducted from 2003 to 2005 determined factors which directly influence a large number of traffic fatalities in operations *Iraqi* and *Enduring Freedom* (having no connection to military operations). The main cause of accidents involving soldiers of the U.S. Forces includes poor condition of roads and bad weather conditions on the one hand, and driver's or passengers' mistakes (unfastened seat belts, speeding in bad weather conditions) on the other hand<sup>173</sup>. As many as 315 British soldiers wounded in traffic accidents were registered in the British Field Hospital in southern Iraq from August 2003 to January 2004 (3 people died, 47 were hospitalized). 32% of those hospitalized soldiers rolled over in a collision, 28% fell out of a vehicle. 34% of all the hospitalized were home-bound for medical reasons<sup>174</sup>. The number of fatalities in the population of soldiers serving in the Stabilization Forces in Iraq and Afghanistan due to non-battle injuries is surprisingly high in relation to the total number of losses suffered in both military operations. In so far as non-battle fatalities accounted for 18% of the total number of victims among soldiers of the Coalition Forces in the operation *Iraqi Freedom* registered until July 2007, in the operation *Enduring Freedom* the rate of such fatalities amounted to 41%<sup>175</sup>. In Iraq the main cause of fatalities with no connection to battle injuries are overland (255 – 36.3%) and aircraft (91 – 13.1%) accidents. Also, it is worth pointing out that as many as 61 fatal accidents were due to misuse of arms. In addition to this, 24 suicides, 8 homicides and 16 incidents of drowning were registered<sup>176</sup>. In Afghanistan fatalities resulting from aircraft (112 – 43.8%) and overland (29 – 11.3%) accidents dominate<sup>177</sup>.

## 2. Battle injuries

Contemporary stabilization missions in Iraq and Afghanistan represent a group of military operations in which the risk of health damage or death is particularly high. The areas of combat operations are at risk from criminal and terrorist attacks. Virtually every day there come about bombings, ambushes with the use of improvised explosive devices, fire-arms (snipers) or artillery weapon (anti-tank launcher, mortars)<sup>175</sup>. As a result of all the risks mentioned above the occurrence of gunshot and shrapnel wounds as well as multiorgan wounds is widespread. Battle injuries resulted in 3,188 fatalities among soldiers serving in Stabilization Forces participating in the operation *Iraqi Freedom* until July 2007 – within just 4 years of the mission's duration. The major cause of death was an enemy's attack with the use of improvised explosive devices (IED) (1,530 fatalities), fire-arms and grenades (405 fatalities) as well as artillery weapon (180 fatalities). 22 deaths occurred as a result of friendly fire – unintentional firing from one's own side<sup>176</sup>. In Afghanistan, similarly to the situation in Iraq, the main cause of deaths due to battle injuries remains the enemy's attack with the use of IED (110 fatalities), fire-arms and grenades (58 fatalities) and also anti-tank launchers and mortars (13 fatalities). Explosion of anti-personnel mines was the reason for 9 fatalities. Out of 369 battle fatalities which occurred during the operation *Enduring Freedom* 10 deaths were the result of friendly fire<sup>177</sup>. So far Americans have suffered the highest number of sanitary losses in both operations, which is definitely connected with the fact that their representation in multinational Stabilization Forces is the biggest. The number of military personnel participating in the operation *Iraqi Freedom* totals 151,000 soldiers from different countries, out of whom 141,000 of the peacekeepers are American<sup>178</sup>. From the beginning of the operation until November 2010 the number of fatalities among American soldiers amounted to 4,427, 31,902 soldiers got injured in combat<sup>179</sup>. Within the same period 318 fatalities occurred among soldiers of different nationalities, including 179 British, 33 Italian and 23 Polish soldiers. Fatalities which occurred in the Polish contingent resulted from battle injuries (14 incidents) and non-battle injuries (8 incidents including 4 overland traffic accidents, 3 aircraft accidents, 1 case of arms misuse). The 23<sup>rd</sup> soldier died in a military operation in Iraq in November 2007<sup>180</sup>. He was the last Polish victim of the war in Iraq (Polish soldiers finished their duty in this country in 2008).

The number of peacekeepers serving in the Stabilization Forces ISAF in Afghanistan totals 132,000. The soldiers come from 47 different countries. Americans contribute 90,000 soldiers in ISAF and further 8,000 in the operation *Enduring Freedom*. The UK contribute a contingent of 9,500 soldiers, Germany – 4,800, Canada – 2,800, and Poland 2,500<sup>181</sup>. The number of fatalities, from the beginning of the military operation in Afghanistan until 2 June 2012, amounted to 3,019 soldiers (1,986 US soldiers and 1,033 peacekeepers of other nationalities). It should be mentioned that Canadians, contributing a



2,800 contingent in one of the most dangerous Kandahar Province, have suffered serious sanitary losses. There were 158 fatalities among Canadian soldiers within the given period, most of them as a result of battle injuries. In the same time, 37 soldiers of the Polish Military Contingent died in Ghazni Province<sup>182</sup>.

Unlimited access of local civilians to fire-arms and explosives constitutes a considerable problem as far as maintaining safety in Iraq and Afghanistan is concerned. Attacks on soldiers participating in military missions are widespread. There are a large number of volunteers willing to act as suicide-terrorists, trap mines are planted along the routes of military convoys and patrols. So far Americans and their allies have failed to introduce law and order in this unstable and dangerous part of the world despite their crushing military superiority. The most serious threat seems to be improvised explosive devices, as Polish soldiers saw for themselves. Military experts suggested ironically that Honker, a Polish military vehicle, should be used in agriculture rather than in combat operations in Iraq. Similar situation took place in Afghanistan where *Rosomak*, another Polish vehicle, got pierced with fire-arm bullets and it required extra strengthening<sup>175</sup>. Over 75% of combat injuries in soldiers participating in contemporary military conflicts relate to limbs<sup>183, 184</sup>. On the one hand, this results from the protection of the head and trunk (helmet, bulletproof or anti-shrapnel vest), on the other hand it is connected with the type of weapons applied (shrapnel wounds resulting from trap mines, grenades, bombs, mortars and gunshot wounds which are the effect of fire-arms use)<sup>46</sup>. The research I have conducted individually among soldiers hospitalized due to battle injuries in the Polish Field Hospital of the Multinational Division Central-South from October 2003 to June 2004 (n = 116) demonstrated that injuries of lower limbs, resulting mainly from gunshot (46%) or shrapnel (42%) wounds prevailed<sup>63</sup>.

It has been estimated that shrapnel wounds, which frequently coexist with bone fracture, soft tissue damage and wound infection, amount to 2/3 of all body injuries sustained in the contemporary battlefield<sup>185</sup>. The risk of shrapnel wounds occurrence is the highest if improvised explosive devices (trap mines) are applied. Their explosion also results in acoustic traumas which are the consequences of a shock wave<sup>186</sup>. In addition to this, the blast of bombs and explosives effect in the occurrence of burns which represent 5% of body injuries among soldiers evacuated from the operations *Iraqi* and *Enduring Freedom* for medical reasons<sup>187</sup>. TBSA (total body surface area) among soldiers who had suffered burns in the battlefield is estimated at 15-21% on average<sup>188</sup>. Military personnel typically suffer from burns of unprotected body parts (face, arms) due to the fact of wearing personal protection clothing (helmet, flak jacket)<sup>189, 190</sup>. The incidence of multiorgan wounds is widespread in the contemporary battlefields. Such injuries occur as a result of damage to soft tissue (skin, subcutaneous tissue, muscles), vessels, nerves and bones. Examination of Soviet soldiers wounded during

the war in Afghanistan in the 1980s revealed that injuries of limbs (sustained in combat) coexisted with damage to great vessels (42% of the cases), nerves (45.5% of the cases) and bones (47.4%). The majority of the injured were in shock (83.7%). 13.9% of patients who sustained a battle injury required amputation of the limb<sup>191</sup>.

In contemporary military operations a lot of attention is paid to efficient medical evacuation from the battlefield to the highest possible level. As yet over 1 million soldiers of the Coalition Forces have taken part in the *Enduring Freedom* and *Iraqi Freedom* operations. More than 20,000 of them have sustained battle injuries while executing military tasks, 46% of the injured required medical evacuation to a home country. Injuries resulting from the blast of explosives, anti-personnel mines, mortars and grenade launchers prevailed<sup>192-194</sup>.

### 3. Mines and unexploded ordnance

The territory of Afghanistan remains one of the most heavily mined areas in the world. Therefore, bombings and ambushes set by the enemy are not the only danger for the Coalition Forces. Mines and unexploded ordnance pose an additional threat. 95% of the mines found in Afghanistan include antipersonnel mines, including blast mines, fragmentation mines, directional mines and scatterable mines, which actuate after a fall from height (an aircraft). Most of the soldiers hospitalized due to a mine explosion were injured by the Soviet PMN mine planted in the territory of Afghanistan in the 1980s<sup>195</sup>. The individual research carried out in the U.S. Army General Hospital in Bagram demonstrated that 286 civilians (103 children and 174 adults), 78 members of the Coalition Forces (77 Americans, 1 German), and 7 Afghan soldiers underwent surgery due to injuries sustained in an explosion of mines, unexploded ordnance or improvised explosive devices within the period from July 2002 to September 2005.

The first military conflict during which land mines were used on a mass scale was the American War for Independence (1775-1783). The use of land mines became widespread during the First World War. Military conflicts which followed propagated the implementation of land mines on a large scale - as one of the basic means of fighting the enemy. However, it soon became evident that land mines are a double-edged weapon - both sides of the conflict suffer losses. And what is worse, the victims of landmines are first of all civilians - people who are not directly engaged in military operations. The majority of modern land mines are made of plastic or other synthetic materials which make them more difficult to detect by means of highly-specialized equipment (detectors). A land mine can be triggered by direct pressure (pressure-operated). Tripwire-operated mines (triggered if a cord attached to a mine gets pulled or broken) are also frequently employed. At present, electronically or radio-operated land mines have been more commonly employed in terrorist attacks. Whereas the placing and arming of landmines is relatively inexpensive (\$3-10) and



simple, the process of detecting and removing them is typically expensive (\$300-1000), slow, and dangerous. Landmines are a deadly weapon, which, from the point of view of their users, makes them highly effective. According to one of the Khmer Rouge general's 'a landmine is a perfect soldier, it is brave, it never sleeps and it doesn't long for anything'. Landmines caused death or permanent disability in over 1 million people all over the world. Still, another 1,000 people die and 800 people get injured as a result of a landmine explosion each month. Every 20 minutes another landmine is detonated. It has been estimated that approximately 110 million landmines remain hidden in 64 countries. The process of demining is slow and dangerous. Combat engineers need to check every square centimeter of the ground to locate any landmines to safely return it to normal use. One combat engineer is capable of searching through an area of 20-50 square meters a day. Assuming that no more landmines were laid, it would take another 1,000 years to demine all dangerous territories. The International Campaign to Ban Landmines achieved a success in December 1997, when the Mine Ban Treaty was signed by more than 130 countries and ratified by another 40. However, the treaty was only half-successful. Some countries have refused to ratify the treaty and they continue to produce and lay landmines. The United States who has not signed the ban committed to do so in 2006.

## BATTLE STRESS

Past experience gained from contemporary military operations points to the fact that a certain percentage of soldiers executing military tasks in extreme situations are incapable of adapting to existing conditions and therefore must be evacuated to their home country for medical reasons<sup>196</sup>. The reasons for being homebound before the termination of service are not only service in a combat zone, adverse climatic conditions and the feeling of alienation, but also a superficially conducted medical qualification of candidates for military service before relocating them to a mission area<sup>197</sup>. This is both the matter of physical health condition (occurrence of chronic illnesses) and mental health condition of candidates for overseas tours. The absence of a reliable psychological profile of a candidate results in the fact that extreme conditions of service may lead to the manifestation or intensification of disorders in the form of neuroses, depression and anxiety<sup>198</sup>. The effects of an experienced mental trauma (a strong or a dramatic event induced by either a brief incident or a long-lasting experience) may be temporary or long-term psychiatric disorders in the form of ASD (*acute stress disorder*) or PTSD (*posttraumatic stress disorder*)<sup>199</sup>. Symptoms of ASD persist for at least several days but no longer than a month (numbness, indifference, excitation or depression). They differ from short-term non-pathological responses to stress which typically occur in the middle of or directly after an experienced trauma and disappear spontaneously. The major difference between PTSD and ASD is the time of manifestation and the period of subsistence of mental disorders (from one month to many years after an experienced trauma). The most commonly occurring

symptoms of PTSD are concentration disorders, recurrent memories and thoughts, nightmares, insomnia<sup>199</sup>. Mental condition of soldiers is predominantly influenced by the view of a battlefield, the sight of the wounded and killed, especially of fellow-soldiers, and also the sight of complete material devastation. The factors mentioned above affect especially soldiers performing extremely difficult and dangerous tasks (landing-assault forces and Special Forces) or deployed in unusual conditions such as siege<sup>200</sup>.

Medical nomenclature of psychiatric disorders occurring in soldiers who suffered traumatic experiences while serving in a combat zone has changed within the last decades. After the First World War veterans suffered from *shell shock*, after the Second World War and the Korean conflict the same disorders were named war *neurosis*, whereas since the Vietnamese war the terms *acute stress disorders* and *posttraumatic stress disorders* have been employed in psychiatry. According to the Polish Ministry of Defense, over 200 soldiers of the Polish Military Contingent failed to cope with the difficulties of the operation *Iraqi Freedom* within the first year of the mission's duration – until September 2004. The majority of them remained in the area for the whole 6 months – until a new rotation of soldiers arrived – even though they demonstrated symptoms of psychiatric disorders in the form of apathy, anxiety, concentration disorders and nightmares. According to psychologists and medical officers participating in the Iraqi mission, each soldier reporting mental problems (because, for instance, he/she got scared of an explosion) is going to be diagnosed with posttraumatic stress disorders. However, there is a serious disadvantage to such actions, as there is a group of soldiers who take advantage of psychiatric consultations and entries in their health records confirming psychiatric disorders as a perfect means of being granted an earlier pension<sup>196</sup>. One of the biggest problems as far as medical coverage of military operations carried out abroad is concerned is the fact that only few clinical psychiatrists participate in such missions. Lack of experience in the field of military psychiatry and examining mental condition of soldiers taking part in combat operations after their return home and not directly after they have experienced a trauma are the reasons why some of opinions issued by Polish psychiatrists are, at best, surprising. Describing the military operation in Iraq as a peace-keeping mission, trying to prove that units of the Polish Armed Forces have not taken part in an armed conflict (e.g. defense of a town hall during the Sadrist uprising in Karbala in 2004) is a huge misunderstanding. Since the beginning of the military missions executed in Iraq and Afghanistan Polish soldiers diagnosed with psychiatric disorders have been evacuated directly to military hospitals in Poland, mostly to the Ward of Clinical Psychiatry of the Clinical Military Hospital in Bydgoszcz or to the Clinical Hospital of Psychiatry and Battle Stress of the CSK MON (Central Clinical Hospital of the Ministry of Defense). Following the termination of hospital treatment patients are sent home, further therapy is carried out either in out-patient clinics of mental health or at psychotherapists' offices in military units



where soldiers are employed. Patients suffering from psychiatric disorders of low intensification, typically being the result of acute stress reaction, do not require medical evacuation to a home country. They stay in the area of operations and remain under supervision of Polish psychologists<sup>201</sup>. Current medical doctrine binding for the Polish Armed Forces assumes that sanitary losses due to psychiatric disorders occurring in operational zones relate to merely 0.1-1% of the personnel. Whereas, doctrines of other NATO armies assume that battle stress accounts for up to 20% of their sanitary losses<sup>202</sup>. Psychiatric disorders, mostly in the form of depression or anxiety, have been commonly observed among soldiers home-bound from Iraq or Afghanistan who have suffered a trauma while on service. Psychiatric disorders may occur both in soldiers who have suffered serious battle injuries and in those who have not sustained any wounds but were put at risk of death or serious health damage. Such complaints do not only occur among soldiers participating in combat actions but also among personnel securing such operations, e.g. medical services<sup>203</sup>. Presently, psychiatric disorders amount to 10% of all medical evacuations of American military personnel from combat zones in Iraq and Afghanistan<sup>204</sup>. According to representatives of the American health service the most commonly occurring psychiatric disorder among soldiers home-bound or evacuated from the territory of Iraq and Afghanistan is PTSD<sup>205, 206</sup>. The number of American soldiers home-bound from operations *Iraqi Freedom* and *Enduring Freedom* complaining of PTSD has been estimated at 15% of the total population participating in both military missions<sup>207</sup>. PTSD is an ongoing emotional reaction to an extreme psychological trauma; its diagnostic symptoms include persistent and sudden re-experience, such as flashbacks and nightmares. If not properly treated PTSD may lead to suicidal thoughts. 24 incidents of suicide among American soldiers participating in the operation *Iraqi Freedom* from April 2003 to January 2004 were officially reported by the U.S. Army officials. However, the number may be much bigger as causes of some deaths in the population of American soldiers have not been unequivocally explained<sup>208</sup>. Veterans Health Administration, an organization providing medical assistance for American war veterans deployed outside the U.S., has estimated that each year approximately 1,000 soldiers and reservists serving in the U.S. Forces commit suicide (the number of all suicides in the U.S. has been estimated at 30,000 a year)<sup>209, 210</sup>. The number of suicides registered in the population of soldiers serving in the Polish Armed Forces is about the same as in other professions. In comparison with the national rate of suicides committed by males the number of suicides in the population of soldiers is distinctly smaller (the total number of suicides in Poland: 2003 - 5,467, 2004 - 4,893, 2005 - 4,621; suicides among professional soldiers and recruits: 2003 - 20, 2004 - 31, 2005 - 21)<sup>211</sup>. The abuse of alcohol and psychotropic drugs is common among patients with PTSD who want to soothe depression, anxiety and insomnia. Coexistence of somatic symptoms on the part of the cardiovascular and the digestive systems is frequently noted<sup>212</sup>. War veterans are often reluctant to accept

any medical help. 80% of American soldiers home-bound from Iraq have not registered in the system controlling their health condition in the U.S. Department of Veterans Affairs<sup>213</sup>. Diagnosis of PTSD is problematic as its diagnostic symptoms may manifest themselves even a year after experiencing a traumatic event<sup>207</sup>.

Extensive studies of this group of psychiatric disorders initiated in the U.S. in the mid 1970s. The results of the research demonstrated that war veterans have difficulties adapting into the society, they also exhibit family, social and health problems. The rates of unemployment, alcoholism, drug addiction and crime are particularly high among military personnel participating in combat operations diagnosed with PTSD<sup>214</sup>. Among 3.14 million American soldiers who took part in the Vietnamese conflict in the 1960s and 1970s fewer than 500 000 people have recently reported symptoms of PTSD and nearly 1 million have reported episodes of PTSD in the past<sup>215</sup>. Similar trend was observed in Russia among veterans of the war in Afghanistan<sup>214</sup>. The PTSD incidence rate among American soldiers participating in the operation *Desert Storm* from 1990 to 1991 ranged from 7 to 22.6%<sup>216, 217</sup>. The growth in incidence rate was observed after termination of service in an operational zone<sup>218</sup>. American soldiers returning from overseas service in Iraq and Afghanistan who had experienced a traumatic event are eligible for specialized medical assistance provided by military health centers supervised by the Department of Veterans Affairs for 2 years after homecoming. They are diagnosed in terms of the occurrence of psychiatric disorders as well as psychosocial disorders. From September 30<sup>th</sup>, 2001 until September 30<sup>th</sup>, 2005 more than 103,000 American soldiers participating in operations *Iraqi Freedom* and *Enduring Freedom* underwent a psychiatric and psychological examination. Over 25% of the studied population demonstrated clinical symptoms of psychiatric disorders, and 31% showed symptoms of psychosocial disorders which required psychological intervention. Pathological changes were most commonly observed in soldiers aged 18-24<sup>219, 220</sup>. Recent studies conducted among the U.S. Forces veterans who have participated in military operations revealed that older soldiers, over 45 years old, are less likely to suffer from psychiatric disorders<sup>221</sup>. The most serious psychosocial disorder in the population of war veterans is alcoholism. The research conducted among American soldiers returning from overseas tours in Iraq and Afghanistan demonstrated that 33% of the respondents abuse alcohol<sup>222</sup>. Alcohol is commonly used by military personnel as a means of dealing with stress. Unfortunately, it significantly lowers morale and discipline. At the very beginning of the stabilization mission in Iraq 7 Polish soldiers, members of the first rotation of the Polish Military Contingent, were sent back home because they were abusing alcohol. This incident revealed the scale of the problem of alcohol abuse in Polish military units<sup>223</sup>. Obviously, alcohol abuse does not only concern soldiers. As many as 800,000 Polish citizens are addicted to alcohol, over 2 million people abuse alcohol, and approximately 4 million live in families where acts of violence resulting from alcohol abuse are nothing out of the ordinary<sup>224</sup>. The relation between the occurrence of psychiatric disorders being the effect of traumatic experiences and



alcohol abuse has been frequently mentioned in international medical writings. According to some British psychiatrists PTSD typically coexists with alcohol abuse in more than 50% of patients<sup>225</sup>. Reports on the occurrence of psychiatric disorders among British soldiers participating in the operation *Iraqi Freedom* issued by British medical services are worth mentioning. The total number of medical evacuations in the population of British soldiers deployed in Iraq in 2003 totaled 2,009 people; as much as 10% of the evacuations were due to psychiatric disorders. What is interesting, 37% of the evacuated soldiers had reported psychiatric disorders before their relocation to the area of operations. 72.4% of the personnel evacuated due to psychiatric disorders were not directly engaged in combat (technical personnel, drivers); merely 27.6% of the evacuated were members of combat units. The main reasons for the occurrence of psychiatric disorders included: environmental factors – 38.5% (hot climate, armed conflict, alienation), isolation from friends and family – 35%, pathological relations in the military community – 7.7%. only 3.4% of the disorders were the result of a psychological trauma suffered in the theatre of operations. All of the British personnel evacuated from Iraq were diagnosed in clinical centers in the UK; adaptation disorders were diagnosed in 50.8% of the examined cases, acute stress response in 6.9% of the cases, 30.2% of patients were not diagnosed with any psychiatric disorder as earlier symptoms had receded<sup>220</sup>. Undoubtedly, the major reason for the occurrence of psychiatric disorders within an operational area of stabilization missions remains the risk of death or serious health damage. Yet, there are also a number of other stress-related factors which facilitate the incidence of the above-mentioned diseases, e.g. adverse climatic and environmental conditions, but also a positive history of psychiatric disorders or usage of psychoactive drugs, which commonly affect the sense of self-esteem in a negative way and in consequence lead to anxiety, depression or irritation<sup>226</sup>. The authority of commanders and their ability to effectively command completely units of armed forces is crucial when it comes to overseas service in areas where armed conflicts escalate. While serving in Iraq and Afghanistan as a medical officer, author of this article treated a lot of soldiers who were on patrol or guard duty. They repeatedly complained of physical and mental exhaustion resulting from noncompliance of their superiors with regulations referring to the relation of working time to free time. Soldiers pointed out lack of experience of their superiors in commanding military units in a theater of war. They also complained about the impossibility of regular visits to a psychologist. Military missions in Iraq and Afghanistan have proved that a Polish soldier has to learn all about the military profession in combat conditions, this relates both to commanders and their subordinates. An experienced commander should be able to significantly reduce sanitary losses resulting from psychiatric disorders among his subordinates. A great number of soldiers who had suffered a psychological trauma can usually return to service quite quickly if only they are given expert psychological advice. Psychologists employed in a theater of operation need to treat an existing disorder as a normal response to an abnormal situation rather than cowardice or avoiding military service<sup>227</sup>. If psychiatric disorders occurring in a combat zone are diagnosed and treated directly

after an experienced trauma their symptoms subside in at least 90% of all cases. Thus, a prompt and effective treatment enables soldiers to return to active service with no health damage<sup>228</sup>. However, there is a group of soldiers who avoid visits to a psychologist or a psychiatrist. Studies conducted among soldiers of the U.S. Forces deployed in Iraq or Afghanistan demonstrated that merely 23-40% of the surveyed diagnosed with psychiatric disorders sought psychological or psychiatric advice within an operational zone. The main cause of such behavior was fear of loss of trust among their fellow soldiers, and being labeled as a weak person<sup>205</sup>. The analysis of morbidity rates in the population of American soldiers has served as a model for the evaluation of health hazards prevailing in the operational areas in Iraq and Afghanistan. The choice of the U.S. Army population was not made at random. The U.S. Forces military personnel accounts for just 1% of the working Americans aged 18-45 (1.4 million soldiers), but it is the best diagnosed and medically consulted social group in the U.S.<sup>229</sup>. The number of American soldiers (of all military formations: Army, Air Force, Navy, Marines) hospitalized from 1990 to 1999 totaled 1,529,323. 13% of all the hospitalizations (194,974) referred to psychiatric diseases and disorders (classified according to ICD-9 were then considered in 8 sub-categories: disorders resulting from addiction to alcohol and/or psychoactive drugs, adaptation disorders, mood changes, psychotic disorders, anxiety disorder, somatic/dissociative disorders, other). Out of the total number of hospitalizations due to psychiatric disorders 56% (109,451) included admissions to psychiatric wards, 16% (31,883) admissions of alcohol or drug addicts to disaccustoming wards, 28% (53,640) admissions to other wards, e.g. internal medicine ward.

The most commonly diagnosed psychiatric diseases were alcoholism and drug addiction, adaptation disorders and personality disorders<sup>229</sup>. The number of the U.S. Forces personnel remaining in active service who underwent treatment for psychiatric disorders in the 1990s was estimated at 6% of all American soldiers. Most likely the number of patients requiring psychological or psychiatric assistance will increase as a result of ongoing military operations conducted in Iraq and Afghanistan. American soldiers deployed in Iraq and Afghanistan suffering from mental disturbances are provided with medical advice at all levels of the military health care system. Teams of psychotherapy ascribed to Combat Stress Control Units, Division Mental Health Sections and Combat Support Hospital have been functioning within organizational structures of the U.S. Forces<sup>230</sup>. There are three groups of patients among military personnel of the U.S. Forces which are particularly susceptible to combat stress: women (combat stress overlapping with sexual harassment or sexual assault), Afro-Americans and Latin-Americans (racism), the sick or wounded (psychiatric disorders overlapping with physical ones)<sup>231</sup>.

Extreme stress being the part of military missions conducted in Iraq and Afghanistan affects each and every peacekeeper<sup>232</sup>. All participants of stabilization missions experience helplessness and vulnerability, they realize they have no influence on the outside world or



health/life-threatening situations taking place around them. Participation in combat actions, witnessing death, the sight of the wounded, killing an enemy (a fellow human-being), unexpected life-threatening attacks (ambushes, explosive devices), the sight of mass sanitary losses among allied troops, the troops of the enemy or among civilians, especially massacred corpses of women and children affect the human psyche in a very negative way<sup>233</sup>. Persistent or emerging stress factors facilitate the development of PTSD. The feeling of euphoria being the effect of safe home-coming quickly subsides and it soon turns out that soldiers need to face and deal with new problems such as a family crises or a marriage breakdown caused by a prolonged absence and thus they become a menace to society. They abuse alcohol, they have sexual intercourse with prostitutes (the risk of an infection), and they avoid psychiatric treatment<sup>234</sup>. Another problematic issue is the fact that a large number of war veterans are commonly diagnosed and treated by family doctors, who typically cannot diagnose psychiatric disorders correctly or they trivialize them, rather than by psychiatrists. Studies conducted in the population of 746 American soldiers home-bound from the operation *Iraqi Freedom* demonstrated that 86 of the examined patients suffered from PTSD (according to Diagnostic and Statistical Manual of Mental Disorders, 4<sup>th</sup> Edition). Previously all of the patients were diagnosed by their family doctors, only 46.5% of the diagnoses were correct<sup>235</sup>. War veterans suffering from psychiatric disorders demonstrate a wide range of responses: from helplessness and anxiety to fits of aggression. However, one should remember that not everyone who had been exposed to an extreme psychological trauma is going to develop PTSD or other mental disturbances<sup>236</sup>. Psychiatric disorders being the result of battle stress are usually clearly defined (acute stress response, PTSD). Yet, some psychiatric disorders, although they have not been precisely defined, were given their names: *soldier's heart*, *effort syndrome*, *non-ulcer dyspepsia*, *effect of Agent Orange*, *Gulf War Syndrome*. All of these accidental diagnoses include a wide range of etiological factors such as effects of hot climate, side effects of vaccinations, taken medicaments, air contamination (caused by burning oil wells), usage of shells with depleted uranium<sup>237</sup>. The explanation of some disorders is fairly straightforward. For instance, medical services of the Israeli Forces define ASD (*acute stress disorder*) as a perfectly normal and temporary response to a traumatic event, which occurred in unfavorable environmental conditions such as shortages of food, sleep, support of fellow soldiers or superiors<sup>238</sup>. Over 90% of soldiers sustaining serious battle injuries survive due to modern equipment (helmets, flak jackets) as well as efficient medical evacuation and prompt stabilization of life functions from the very moment of sustaining an injury<sup>239</sup>. Nevertheless, post-traumatic amputation of limbs, loss of vision or other forms of disabilities are widespread. Studies conducted in the population of American soldiers participating in the Vietnamese conflict demonstrated that the risk of developing psychiatric disorders was particularly high among seriously wounded patients. Therefore, it is extremely important to treat physical and mental disorders simultaneously<sup>240</sup>. The research conducted among American soldiers returning from overseas tours

from 2003 to 2004 revealed the occurrence of psychiatric disorders (mainly in the form of PTSD and depression) in 19.1% of the *Iraqi Freedom* participants (n = 222,620), 11.3% of the *Enduring Freedom* participants (n = 16 318) and 8.5% of soldiers taking part in other military operations abroad (n = 64,967)<sup>241</sup>. In recent years the percentage of military personnel exposed to a traumatic event while participating in combat actions has dropped considerably. Whereas during the First World War as much as 73.4% of soldiers were directly engaged in combat, during the Second World War – 52% and during the operation *Desert Storm* – only 19.8%. However, sanitary losses in the population of soldiers participating in military operations due to psychiatric disorders remain at a high level<sup>242</sup>.

## SUMMARY

Contemporary military operations – peacekeeping and stabilization missions – have been executed in territories characterized by difficult climatic and sanitary conditions, in areas where in connection with ongoing hostilities, a risk of the occurrence of different diseases and injuries is particularly high. The main factors which determine the growth in morbidity and traumatism are as follows: escalation of an armed conflict, hot climate, unsatisfactory sanitary-hygienic standards in areas of deployment, and also cultural differences of a given region. Military service goes hand in hand with an increased risk of sustaining battle injuries (gunshot and shrapnel wounds) or non-battle injuries (sports injuries, traffic accidents). Low sanitary and hygienic standards facilitate the occurrence of contagious and parasitic diseases of the digestive tract, vector-borne diseases, diseases of the respiratory tract and sexually transmitted diseases. Cultural differences and alienation of a closed community in connection with traumatic experiences suffered in the area of an armed conflict are extremely stressful and induce the occurrence of psychiatric diseases and disorders. Acquiring expertise in preventive medicine, which may prevent the occurrence of infectious and non-infectious diseases as well as battle injuries or non-battle injuries, remains one of the major tasks that medical staff of military missions has to handle. Therefore, it is crucial to have the right knowledge of an up-to-date epidemiological situation and health hazards influencing the growth in the incidence of diseases and injuries in operational zones of peacekeeping and stabilization missions. A detailed analysis of data regarding diseases and injuries of soldiers deployed in areas of military operations is also necessary. Such analyses may be further exploited to create a health policy which could be implemented in armed forces of particular countries. In the era of military operations executed under the auspices of international organizations expertise in the field of health hazards remains a fundamental issue which determines success in fulfilling the assigned tasks.

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