

Environmental Health Hazards on the Territory of Iraq Among Soldiers of Stabilization Forces

K. Korzeniewski^{1*}, R. Olszański¹, J. Jerzemowski¹, R. Nowicki²

¹ The Military Institute of Medicine, Department of Maritime and Tropical Medicine,
81-103 Gdynia 3, 4 Grudzińskiego St., Poland

² The Medical Academy, Department of Dermatology, Venereology and Allergology,
80-211 Gdańsk, 7 Dębinki St., Poland

Abstract

Since March 2003, thousands of Stabilization Forces' soldiers stationed in Iraq have been affected by numerous environmental risk factors leading to the increased incidence of diseases and traumas. The region of Persian Gulf, especially the territory of Iraq, has long been the terrain of hostilities which, together with the catastrophic sanitary-hygienic conditions of the cities and villages combined with the high ambient temperature, facilitate the spread of both infectious and non-infectious illnesses.

In addition to listing the existing health hazards in Iraq, the present report demonstrates basic preventive measures against the diseases and traumas. Indeed, in a country abundant in numerous health and life risks for the people, knowledge and understanding of the elementary preventive and protective measures is a matter of the utmost importance.

Keywords: Iraq, health hazards, preventive measures

Introduction

Epidemiological situation of Iraq and health status of Iraqi population before the operation "Desert Storm" (1990-91) was comparable to the epidemiological rates of average developed countries. The health care system was one of the best in the Middle East and malnutrition hardly occurred there. According to the governmental sources, 97% of the urban- and 79% of the rural populations had free access to the primary medical care [1]. Malaria was effectively fought and the children were routinely vaccinated against dangerous infections. However, within the last decade the situation has dramatically changed for the worse. As the access to the

health care institutions is now difficult, WHO and UNICEF have estimated that for every 10 thousand citizens without treatment remain 30 children with diarrhoea, 55 children with respiratory system disorders (including 5 with pneumonia), and 30 patients with diabetes [2, 3]. Acute infections of the lower airways as well as infectious and parasitic diseases of the digestive tract are the main causes of morbidity and mortality in the country. Indeed, these two groups of diseases contribute to 70% of deaths of children less than 5 years-old [4].

The hostilities in March and April 2003 almost completely damaged the country's infra-structure. The water-pipe network and sewerage systems were

destroyed. There are problems with collecting and recycling municipal refuse in the cities and villages. Many public buildings, including outpatient clinics and hospitals, were devastated. Basic medicines and dressings are lacking. The health and life of the people are seriously endangered by the local fauna as well as by the commonly contaminated food and water supplies [5].

Under such conditions dozens of thousands of the Stabilization Forces' soldiers from many countries, are currently doing their duty in Iraq. For soldiers used to a temperate climate understanding potential threats, rules of behavior, and effective preventive measures is of crucial importance for their survival and performance. In the present report, major health risks for the military personnel in Iraq, such as thermal injuries, infectious diseases, threats from the local fauna, and preventive measures against these hazards are presented and discussed.

Thermal Injuries

A heat injury results from the loss of heat balance of the organism which is defined as the ratio of heat produced during the metabolism and obtained from the environment to the heat lost from the body (by way of radiation, convection, conduction, evaporation, and respiration). Such an imbalance may result from insufficient intake of water and electrolytes, excessive physical activity at high ambient temperature, lack of appropriate protection during exposure to the sun, use of inhibitors of perspiration (e.g., atropine, antihistaminics) [6], overuse of alcohol and caffeine which increase dehydration, obesity, elevation of the body temperature during infections, wearing clothes (uniforms) impermeable to air [7].

Main types of heat injuries include: heatstroke, heat exhaustion, heat cramps (myspasms), sunstroke, and sunburn [8]. According to the U.S. Army medical sources at least 4 deaths as a result of heatstroke were reported among American soldiers serving in Iraq in 2003 [9].

Preventive measures against heat injuries include the following: appropriate planning of the work and resting cycle in accordance with the climatic demands, consumption of sufficient amounts of water and electrolytes, consumption of all daily food rations, when possible, acclimatization of the personnel for 10-14 days, regular use of sunscreens and other sun protectors, avoidance of the excessive consumption of alcohol and caffeine, wearing appropriate (i.g., made of the air permeable, "breathing" fabrics) clothes [6, 9].

Infectious Diseases

According to the Armed Forces Medical Intelligence Center of the US Army, Iraq is a high risk country with respect to the incidence of infectious diseases [9]. This

estimation has been based on the following factors: significant contamination of water and soil with pesticides, industrial waste, sewage, excrements, etc., inappropriate purification of drinking water, catastrophic state of the water-pipe system, water recycling stations, and sewage treatment plants, large number of asymptomatic carriers of infectious and parasitic diseases among the local population [10, 11].

Unless basic rules of the preventive medicine are obeyed by the military personnel, the peacekeeping activities within the mission area are seriously endangered [12]. Main threats to the Stabilization Forces in Iraq stem from food- and water-borne diseases (caused by consumption of the inappropriately processed, stored and/or prepared food or drinking water from unknown sources), arthropod-borne diseases, and sexually transmitted diseases (of lesser importance) [6, 10].

Food- and Water-Borne Diseases

The most important symptoms and diseases caused by consumption of the contaminated food and/or water are diarrheas, characterized by: high morbidity rate (occur in over 50% of personnel consuming the local food, water, and ice used in drinks), prevalence on the whole territory of Iraq regardless of the season, rapid onset and short duration (usually less than 3-4 days), large number of asymptomatic carriers, in non-native patients develop usually as a result of change of the digestive tract's bacterial flora ("traveller's diarrhea") [10]. Major etiological factors include enterotoxigenic pathogens such as *Escherichia coli*, *Campylobacter*, *Shigella*, *Salmonella*, *Entamoeba histolytica*, *Giardia intestinalis*, and *Hepatitis A* virus [11]. 50% of acute gastrointestinal tract disorders treated in the Field Hospital in Iraq among Polish soldiers (October 2003-March 2004) were caused by strains of *Escherichia coli* [13].

Preventive measures against the above afflictions include the following: drinking water should be obtained only from the bacteriologically and physicochemically monitored sources, drinking and industrial water should be chlorinated, water containers and tankers should be properly cleaned and disinfected, ice cubes from local sources should be avoided, food should be properly stored and prepared, fruits and vegetables should be disinfected with the iodine solution, food should be purchased only from the approved and checked producers/distributors, meals at local bars should be avoided, the canteen, food magazines, and kitchen equipment should be maintained at the proper sanitary level according to the hygiene directives of the stabilization mission, stress should be put on personal hygiene (especially washing hands before meals) of the military personnel, personnel should be vaccinated against viral hepatitis A and typhoid fever before deployment to the mission area [14, 15].

Arthropod-Transmitted Diseases

Most important vectors of these diseases include mosquitoes, flies, sand flies, ticks, lice, and fleas. Basically, two arthropod-borne diseases are of epidemiological importance in Iraq. These include malaria and leishmaniasis.

Malaria occurs in Iraq seasonally, from May to November. 99% of cases in the territory of the country are caused by *Plasmodium vivax* and few may be caused by the unusual in Iraq *P. falciparum* (imported from Iran). Infection with *P. vivax* usually is not fatal as resistance to Chloroquine is very rare. The disease is endemic in northern Kurdistan (at the altitudes not exceeding 1,500 m above the sea level, including the towns of Al Sulaymaniyah, Dahuk, Irbil, and Kirkuk) and in the south of the country, in the Basra Province (predominantly on the swamps along the rivers) [7, 11]. Importantly, thrifty use of water in many regions of Iraq often eliminates the opportunity for mosquitoes to thrive and breed. Generally, new cases of malaria in Iraq are treated on the spot and the use of mosquito nets and repellents (e.g., ICON, a synthetic pyrethroid) is a common practice. In 2001, the registered cases of malaria in Iraq equalled to 1,120 and were significantly less than those recorded in 1995 (98 thousand registered cases). The war in 2003 (Operation Iraqi Freedom) markedly limited the availability of health care, drugs and personal protectors (repellents) to the Iraqi people. According to WHO and the Iraqi Ministry of Health the incidence of malaria in the northern part of the country will increase compared to the year 2001 [10, 11]. Soldiers of the Stabilization Forces infected with *P. vivax* return to duty after treatment with Chloroquine (initial dose – 1g, after 6 hrs – 0.5g and during the following 3 days – 0.5 g daily) provided that they were promptly diagnosed and no complications ensued [9]. Malaria doesn't pose serious epidemiological threat among soldiers of the Stabilization Forces serving in Iraq [6].

Leishmaniasis occurs in Iraq seasonally, from May to October. Two clinical forms of the disease: cutaneous and visceral (*kala-azar*) occur in the territory of the country. According to the Iraqi Health Service, 625 cases of the cutaneous (2.3 per 100 thousand people) and 2893 cases of the visceral leishmaniasis (10.9 per 100 thousand people) were recorded in the country in 2001. In Iraq, the cutaneous leishmaniasis is caused by *L. major* (animals are the source of infection) and *L. tropica* (when humans are the source of infection). Visceral leishmaniasis is caused by *L. donovani* and dogs and foxes are the predominant source of infection [10, 11].

By the end of March 2004, the Walter Reed Army Medical Center (WRAMC), USA (a reference tier for the treatment of leishmaniasis in the U.S. Military), confirmed and treated 653 cases of the cutaneous and 2 cases of the visceral form of the disease among soldiers

of the Stabilization Forces who had served in Iraq between March 2003 and March 2004 [16]. Presumably, the number of the infected soldiers may be even higher and reach at least 750-1,250, which makes up to 1% of the US Army troops serving in Iraq in that period of time. American soldiers diagnosed with leishmaniasis are routinely evacuated to the WRAMC and treated with the pentavalent antimony compounds, after which they return to their units in Iraq [17]. With respect to Polish soldiers, by the end of December 2004, no confirmed case of leishmaniasis was reported among the Polish military personnel stationed in the Iraqi provinces of Babil, Karbala, and Wasit [18].

Suggested preventive measures against the arthropod-borne diseases consist of the following: avoid places of the common occurrence of the infection vectors, especially during the time of their highest activity (eg., from dusk to dawn), wear the long-sleeve shirts and long-leg trousers [14], put protective on the windows, use mosquito nets when sleeping, spray uniforms and mosquito nets with repellents (Permethrin) and put DEET (N,N-diethyl-metatoluamide) on bare skin [9], use chemoprophylaxis in case of malaria (Chloroquine 0,5 g every week: 1-2 weeks before deployment, during the stay in the endemic zone, and 4 weeks after home-coming) [6].

Sexually Transmitted Diseases (STDs)

This group include illnesses caused by bacteria, viruses, protozoa, fungi, and ectoparasites. Casual, unprotected (neglect of condoms) intimate sexual activities are the main cause of contraction of STDs. In 2000, among Iraqi population more than 30 thousand cases of STDs were reported (mainly gonorrhea, chlamydiasis, trichomoniasis) [10]. Among soldiers of the Stabilization Forces in Iraq STDs have no epidemiological importance [6, 9].

Threats from the Local Fauna

Venomous arthropods and reptiles are widespread in the Middle East including Iraq. Scorpions are especially common in the northern part of the country. Black scorpion, (*Androctonus crassicauda*) belongs to the most dangerous species. Each year several deaths resulting from the bites of these arthropods are registered mainly among children and the elderly. Among spiders, the genus *Latrodectus* is particularly dangerous [19]. Common arthropod in Iraq is Camel spider. In fact, it is not a spider but an arthropod of the *Solifugae* genus, the intermediate between a spider and a scorpion. It is a nocturnal animal that can run at 15 km/h and achieves the size of 2.5-15 cm depending on the species, sex, and age. It is non-poisonous, does not spin a web, but has huge jaws to kill and eat its prey (i.e., scorpions, spiders, mice, and lizards). The animal uses shreds of a camel fur

to pad its den (hence its name) and can be found in human dwellings [9].

Although there are over 20 species of snakes in Iraq, of which several are poisonous, the bites of humans are relatively rare. The poisonous species include the Desert Black Snake (*Walterinnesia aegyptia*), Blunt-nosed Viper (*Vipera lebetina*), Persian Sand Viper (*Pseudocerastes persicus persicus*), Desert-horned Viper (*Cerastes cerastes*), and Saw-scaled Viper (*Echis carinatus*) [19]. The most dangerous among them is Desert Black Snake. It is a nocturnal, poisonous reptile reaching up to 1 m in size. It hunts using the sense of smell, as its sight is rather weak. Since its venom is neurotoxic, antitoxic serum must be applied shortly after the bite in order to prevent the death of the victim. Although, according to the Iraqi sources, the snake is widely spread throughout the country, the US Army medical services have announced that over the last decade the snake has been seldom encountered by the US personnel in Iraq [9]. Bites of arthropods and reptiles among soldiers of Stabilization Forces in Iraq are noticed sporadically [6, 9].

Prophylactic measures against bites of the arthropods and reptiles include the following: avoid touching and/or capturing scorpions, spiders, and snakes, do not keep food in containers and tents accessible to rodents, do not put hands into obscure and dark places, shake off shoes and sleeping bags before putting them on, do not unnecessarily walk outdoors in the night [6, 12]. In case of a bite by an arthropod or a reptile the following are recommended: if possible, the victim should walk away from the place of the accident, the victim should stay calm (most bites, even by poisonous snakes, are not lethal), the bitten limb should be kept immobile at or below the heart level, the wound shouldn't be cut or sucked out with a mouth (if possible, a special under-pressure extractor should be used), no tourniquet should be applied, medical assistance should be sought as soon as possible, the patient shouldn't eat or drink, unless allowed by the medical personnel [6, 12].

Conclusions

Proper sanitation and medical care are crucial for maintenance of the appropriate physical and mental health of the military personnel on a mission in the hot climate. The sanitary and medical supervision of the soldiers begins prior to the deployment, is continually performed in the mission area, and finally, is carried out directly after return home. Before the deployment, military personnel should undergo estimation of the health status and qualification for the mission, necessary vaccinations, sanitary instructions, first aid trainings, malaria chemoprophylaxis. Training and exercises of the mission sanitary teams should also take place during this preparatory period [20].

In the mission area, the following rules must be obeyed: sanitary teams should supervise and monitor the sanitary conditions in the area and train the personnel in health promoting means and measures, personnel should adhere to the proper work and rest cycle to avoid thermal injuries, consumption of the local food and water from unknown sources should be prohibited, casual sexual activities should be avoided, personal hygiene should be observed, chemoprophylaxis of malaria should be maintained, individual protective means, such as mosquito-nets and repellents, should be routinely used [21]. After return from the mission, the military personnel must be assessed for their health status and subjected to malaria chemoprophylaxis. In addition, the sick and wounded should be taken good care of and special attention should be paid to patients with mental disorders and fever of unknown origin [14, 15].

References

1. THE WORLD FACTBOOK 2005. Country profile – Iraq. <http://www.odci.gov/cia/publications/factbook/geos/iz.html>
2. RELIEFWEB. WHO says Iraq facing health catastrophe, 20.05.2003. <<http://www.reliefweb.int/w/rwb/nsf>>
3. UNICEF Humanitarian Action. Iraq Crisis Preparedness. Donor Alert, 20.03.2003. <<http://www.unicef.org/emerg>>
4. UNICEF in Iraq. Children and Women in Iraq, March 2003. <<http://www.unicef.org/media/iraqfactssheetfacts.htm>>
5. WHO Report. Briefing note on the potential impact of conflict on health in Iraq, 20.03.2003. <<http://www.who.int/country/irq/en>>
6. KORZENIEWSKI K.: Health hazards in Iraq. The Second Polish-Chinese Medical Meeting „Diseases of the XXIst century”, Warsaw, 6-8.12.2004.
7. KORZENIEWSKI K.: Iraq. Wydawnictwo Akademickie DIALOG, Warszawa, 2004 (in Polish).
8. RAWSKI S.: Heat injuries and military training. Survey of Army Forces 64-67, 2000. (in Polish).
9. KNIGHT K.: Preventive Medicine Assessment of Iraq. 804th Medical Brigade, Iraq, 08.2003.
10. KORZENIEWSKI K.: Epidemiological situation of Iraq, Military Doctor 80(4), 225-229, 2004 (in Polish).
11. WHO. Communicable disease profile for Iraq, 19.03.2003. <<http://www.who.int/infectious-disease-news/IDdocs/whocds200317/1profile.pdf>>
12. USARIEM Technical Note 95-1. Sustaining Soldier Health and Performance in Southwest Asia: Guidance for Small Unit Leaders, Maryland, 1994.
13. KORZENIEWSKI K.: Incidence of diseases and traumas in the population of Polish soldiers treated in the Field Hospital of the Multinational Division

- Center South in Iraq, *Military Doctor* **80(3)**, 203-207, **2004** (in Polish).
14. KORZENIEWSKI K.: Prophylaxis of infectious and non-infectious diseases with particular attention to health prevention in the hot climate conditions, *Military Doctor* **81(3)**, 184-188, **2005** (in Polish).
 15. RAWSKI S.: Areas of preventive medicine activities in protection of troops against health risks. *Military Doctor* **1-2**, 78-86, **1999** (in Polish).
 16. MMWR. Cutaneous leishmaniasis in U.S. military personnel – Southwest/Central Asia, 2002-2004, *Morb. Mortal. Wkly Rep.* **53(12)**, 264-5, **2004**.
 17. WEINA P. J., NEAFIE R. C., WORTMANN G., POLHEMUS M., ARONSON N. E.: Old world leishmaniasis: an emerging infection among deployed U.S. military and civilian workers, *Clin. Infect. Dis.* **39(11)**, 1674-80, **2004**.
 18. KORZENIEWSKI K.: Cases of leishmaniasis among soldiers of Stabilization Forces in Iraq, *Military Doctor* **80(4)**, 250-255, **2004**.
 19. Regional Disease Vector Profile. The Middle East. Defense Pest Management Information Analysis Center, Walter Reed Army Medical Center, Washington DC, **1999**.
 20. KORZENIEWSKI K.: Medical assessment of candidates for service in the peace and stabilization missions abroad. *Military Doctor* **81(3)**, 206-209, **2005** (in Polish).
 21. KORZENIEWSKI K.: Task and organization of health service of Multinational Division Center South in Iraq. *Military Doctor* **80(3)**, 192-195, **2004** (in Polish).