Prevalence of Intestinal Protozoan Infections among European UN Peacekeepers in Chad, Central Africa.*

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RESUME

Prévalence des protozooses intestinales parmi le personnel de maintien de la paix au Tchad, Afrique centrale.

Objectif : *Evaluer la prévalence des infections dues à Giardia intestinalis identifiées chez les soldats polonais servant une mission des Nations Unies (MINURCAT) dans l'est du Tchad en Afrique centrale.*

Matériel et méthodes : *Les échantillons analysés étaient des selles provenant de 247 militaires polonais âgés de 21 à 51 ans, séjournant de façon temporaire (8 mois de novembre 2008 à avril 2009) en région sahélienne. Trois échantillons de selles ont été collectés pour chaque patient. Les échantillons ont été ensuite analysés à la recherche de protozoaires responsables d'infections d'origine hydrique. L'examen direct a été réalisé en microscopie optique après montage en Lugol et décantation en eau distillée.*

Résultats : *L'analyse pratiquée chez les 247 militaires a révélé 55 cas de giardiase (Giardia intestinalis) soit un taux de prévalence de 22, 5 pour cent.*

Conclusion : *L'est du Tchad, région dans laquelle les soldats des Nations Unies exercent leur mandat est à risque de maladies à transmission hydrique. La source de ces infections est constituée par les collections d'eau. Le traitement des cas et l'introduction des mesures de contrôle sont nécessaires pour réduire l'incidence des giardiases chez les militaires. Les infections à protozoaires constituent un problème de santé non seulement pour le personnel en mission mais aussi pour les familles dans leur pays d'origine où ces pathogènes peuvent être importés.*

KEYWORDS: Giardiasis, UN soldiers, Chad, Africa.

MOTS-CLÉS : *Giardiases, Soldats des nations unies, Tchad, Afrique.*

INTRODUCTION

In August 2008 soldiers of the Polish Military Contingent (PMC) executing mandatory tasks within the framework of the European Union operation (EUFOR since 15th March, 2009) and later as part of the UN peacekeeping mission (MINURCAT – *United Nations Mission in the Central African Republic and Chad*), was relocated to the North Star military base in eastern Chad. The main aim of this military operation, conducted with the participation of Polish soldiers, was to secure safety and stabilization in eastern part of the country which has sheltered thousands of refugees fleeing from neighboring Sudan.

The assignment of the Polish Armed Forces in Africa terminated on 17th December 2009. Throughout the period mentioned above three rotations of Polish soldiers were deployed to Africa, the 2nd rotation was the largest (November 2008 – April 2009, 320 persons).

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The mandatory tasks of the PMC Chad were executed in extreme environmental conditions, completely different from those prevailing in a temperate climate zone. Military service in Chad was quite a challenge for Polish soldiers since their last deployment to the tropics, in the intertropical convergence zone, took place in Cambodia (1992-93) and Haiti (1994).

Chad is a landlocked country located in Central Africa. It's major geographical regions are the Sahara desert zone in the north, the Sahelian belt in the centre, and a savannah zone in the south. The temperatures in the Sahara desert range from 49°C in May (the warmest month) to 36°C in December. Bothersome sand and dust storms occur in the region. The central part of the Sahelian belt (the place of deployment of Polish soldiers) demonstrates similar temperatures as those prevailing in the Sahara. The dry season lasts for 8 months (from October to May). The average annual rainfall amounts to approximately 700 mm. The southern part of the country, where the subtropical climate prevails, is characterized by temperatures ranging from 41°C in March to 14°C in December. The wet season lasts from May to October. The average annual rainfall totals 900-1200 mm[1-3]. Merely 42% of the Chadian citizens have access to uncontaminated drinking water, while 9% have access to sanitary fittings which comply with basic sanitary requirements[4, 5]. Chad is regarded as a high-risk country in terms of the occurrence of infectious diseases. This situation is mainly influenced by contamination of water and soil (sewage and excrement), limited access to uncontaminated drinking water, food market uncontrolled by sanitary services, a large number of asymptomatic carriers of infectious diseases[6, 7]. A high incidence of diarrhoeas is reported in the territory of the whole country regardless of the season. The major infectious etiological factors of gastrointestinal diseases are enterotoxic *Escherichia coli, Campylobacter spp., Salmonella spp., Shigella spp.*, adeno- and rotaviruses, and protozoa *Giardia intestinalis, Cryptosporidium parvum* and *Entamoeba histolytica s.l.*[8].

Acute gastrointestinal disorders which are diagnosed by medical services among participants of military operations are not usually classified as infectious because it is impossible to conduct diagnostic procedures for the presence of digestive tract pathogens[9]. The aim of this article was to present the results of the research into the prevalence of intestinal protozoan infections with *Giardia intestinalis* among Polish soldiers serving in the United Nations operation (MINURCAT) in eastern Chad, Central Africa.

MATERIALS AND METHODS

Study subjects.

The material subjected to analysis was faecal specimens collected from 247 symptomatic and asymptomatic patients of Polish nationality aged 21 to 51, residing temporarily (6-month period, November 2008 – April 2009) in the Sahel region, as participants of a military operation in eastern Chad (77.2% of soldiers of Polish Military Contingent serving in that period).

Data collection.

Three samples of faeces were collected from each patient every 2-3 days. The samples were then analyzed in terms of incidence of water-borne infections caused by *Giardia intestinalis* pathogen. Stool collecting and testing was conducted by medical staff of the UN military operation in April 2009. Biological material was also fixed in 10% formalin concentrate and sent to Poland where results were confirmed in Epidemiology & Tropical Medicine Department of Military Institute of Medicine.

Analytic methods.

Examination of faecal specimens collected from symptomatic and asymptomatic patients in direction of prevalence of intestinal protozoan infections was conducted on the basis of two laboratory testing methods:

- direct smear in Lugol's solution.
- preparation from decantation in distilled water.

Direct smear in Lugol's solution.

Approximately 2 mg of faeces was taken with a glass rod and applied onto a slide, a drop of Lugol's solution was added and the material was smeared over the surface of 4 cm^2. Next, a cover slide was placed on top of the preparation and the material was examined microscopically under correct magnification. The material

Photo 1: Water examination in eastern Chad.
Source: PMC Chad. Author's collection.

Photo 2: Water examination in eastern Chad.
Source: PMC Chad. Author's collection.

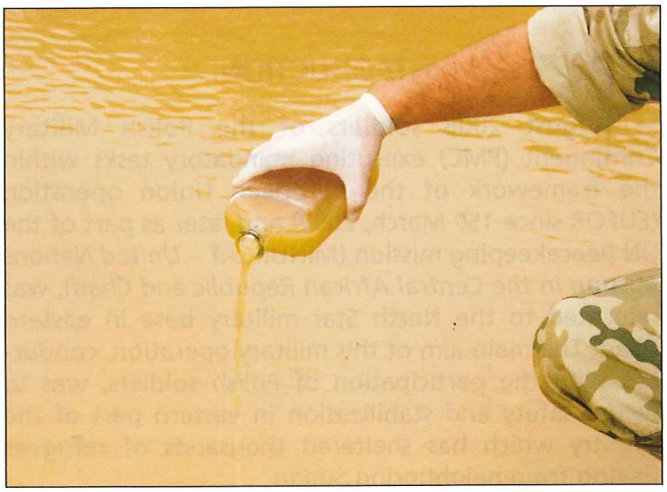


Photo 3: Microbiological water examination in Polish Military Contingent in Chad.
Source: PMC Chad. Author's collection.

Photo 4: Microbiological water examination in Polish Military Contingent in Chad (Enterococcus faecalis).
Source: PMC Chad. Author's collection.

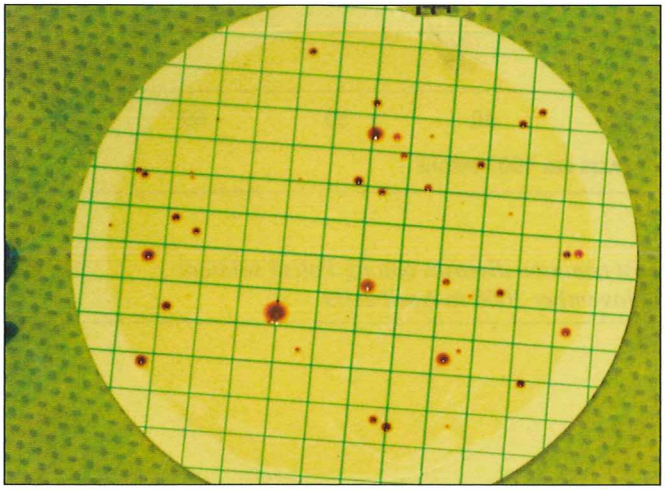


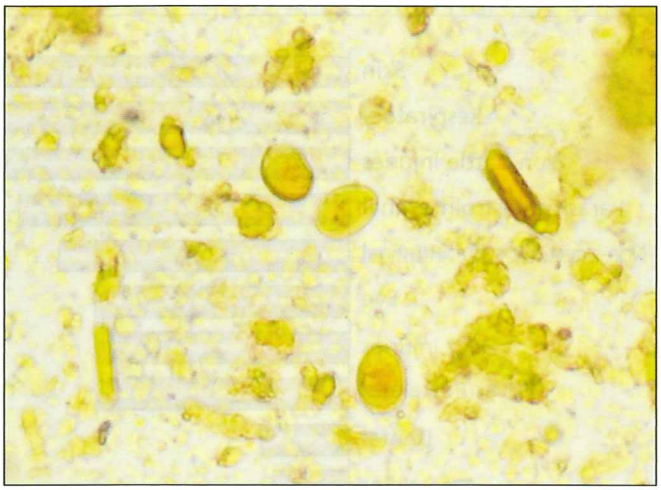
Photo 5: Stool testing in Polish Military Contingent in Chad.
Source: PMC Chad. Author's collection.

prepared by means of such a method allows the diagnostician to conduct an initial analysis of material, while staining a smear with Lugol's solution improves the quality of the picture of detected parasites.

Preparation from decantation in distilled water.

Approximately 2 g of faecal specimen was thoroughly mixed with a small amount of water in a test tube. Next, water was added to the top of the tube. After 30 minutes the supernatant was decanted and another portion of water was added. This procedure was repeated several times until clear supernatant was obtained – generally 3-4 times. After that, slides were prepared for microscopic examination – the sediment was placed on a slide and stained with Lugol's solution.

Photo 6: Stool testing in Polish Military Contingent in Chad (Giardia intestinalis). *Source: PMC Chad. Author's collection*



RESULTS

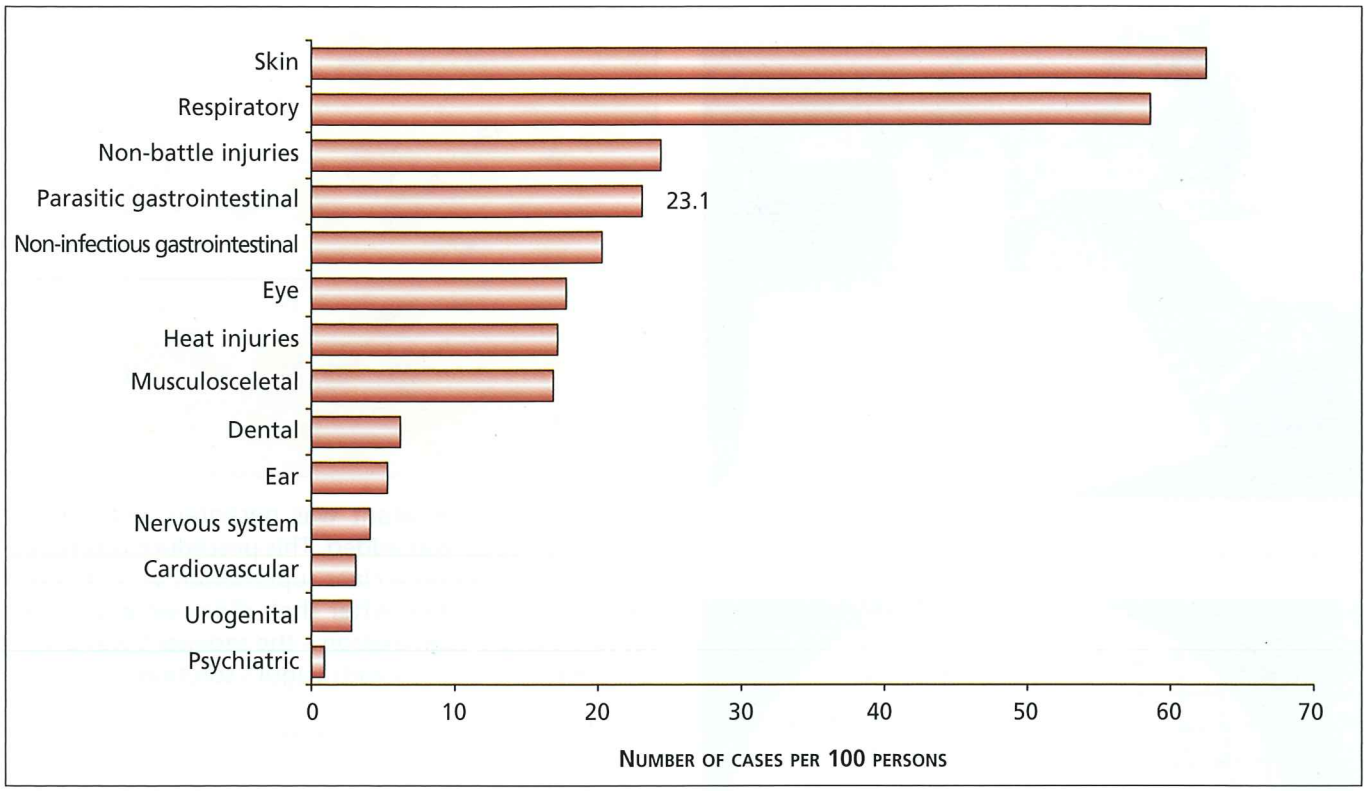
Parasitological tests for the presence of intestinal infections were conducted among the UN soldiers serving in the Polish Military Contingent in Chad (n = 247) at the North Star base in April 2009. The examination conducted by means of a light microscope demonstrated a large number of protozoan infections (55 cases of *Giardia intestinalis* and 2 cases of *Entamoeba histolytica s.l.*).

The most common health problems diagnosed among of Polish soldiers executing mandatory tasks within the framework of the EUFOR/MINURCAT military operations in Chad in the period November 2008 – April 2009, except for parasitic gastrointestinal diseases (23.1 cases/100 persons; giardiasis 22.3 cases/100 persons) were skin diseases (62.5/100 persons), respiratory tract diseases (58.6/100 persons), non-battle injuries (24.4/100 persons), non-infectious gastrointestinal diseases (20.3/100 persons), eye diseases (17.8/100 persons), and heat injuries (17.2/100 persons). Reported health problems were primarily the result of harsh environmental conditions characteristic of the hot climate and disregard of basic health prevention measures (Fig. 1, 2).

DISCUSSION

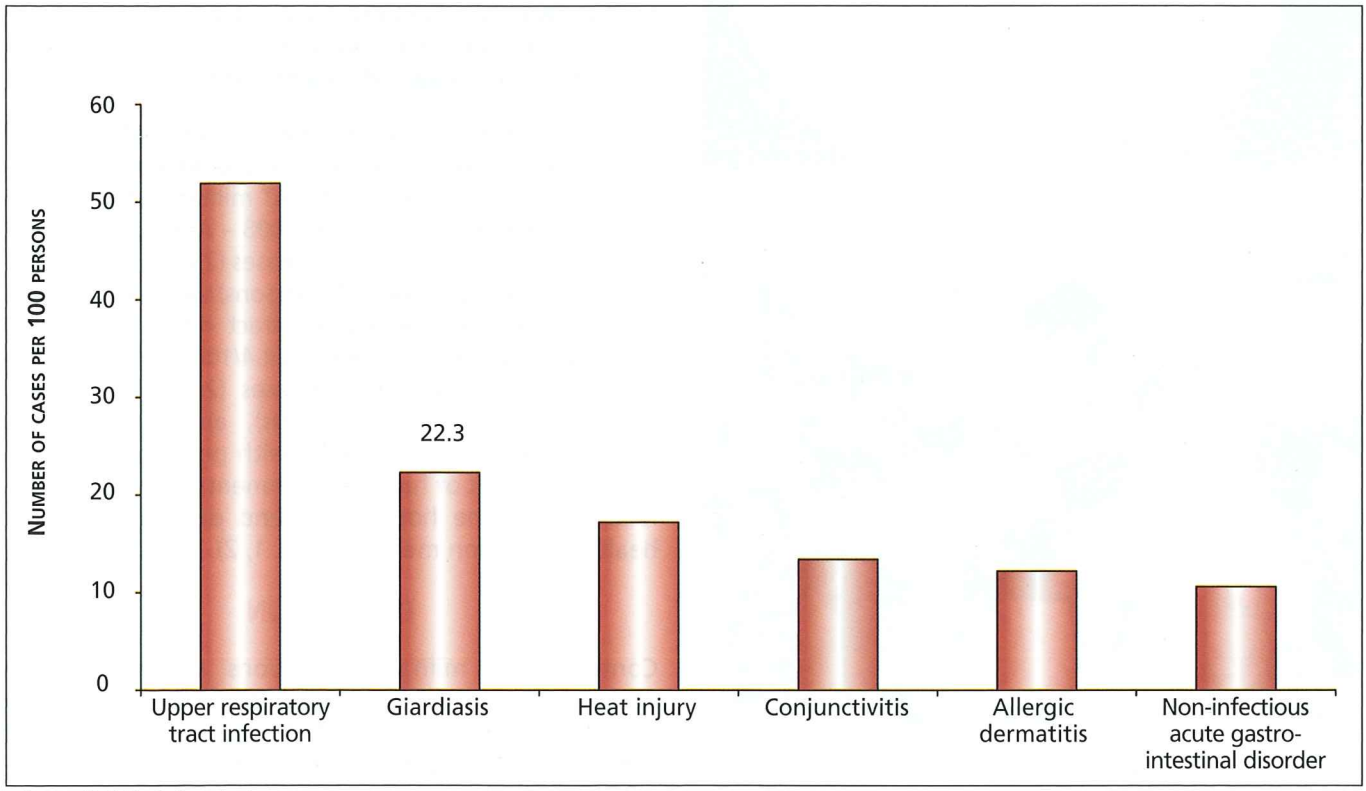
Contemporary military operations are executed in areas characterized by adverse climatic and sanitary conditions, where, as a result of ongoing hostilities, hot climate and low hygienic standards the risk of developing infectious and parasitic diseases is much increased[10, 11]. Participants of military operations are at risk from different pathogens causing food- and water-borne diseases[12]. Infestations with helminthes and protozoa are widespread[13]. Currently, it has been estimated that diarrhoea occurs in more than 50% of all military personnel assigned to a tour of duty in countries characterized by poor sanitary conditions[14]. The spread

Figure 1: Prevalence of parasitic gastrointestinal diseases and other health problems among Polish soldiers (n = 247) in PMC Chad from November 2008 to April 2009.



Source: PMC Chad. Own studies.

Figure 2: Prevalence of giardiasis and other the most common diseases among Polish soldiers (n = 247) treated in PMC Chad from November 2008 to April 2009.



Source: PMC Chad. Own studies.

of diarrhoeal diseases is also determined by a high proportion of carriers of intestinal pathogens among the local population and by contamination of food and water[15].

The author of this article conducted medical research in eastern Chad (an area of deployment of Polish troops) during the dry and wet season (April, August 2009). The primary aim of the study was to analyse the incidence rate of intestinal parasitic diseases among Polish soldiers assigned to military service in Central Africa. The results of the research, which demonstrated numerous invasive infections in military personnel, motivated

the author to conduct further research into the prevalence of intestinal parasites in the Polish Armed Forces[16]. Military medical services have limited capabilities of conducting parasitological diagnostics in the area of operations. Therefore, it is absolutely necessary to establish a research centre functioning under the authority of the National Armed Forces, whose aim would be to conduct parasitological tests in the post-deployment period. Such a research centre has been founded on the basis of the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine in Poland. And the main objective of the Department, in accordance with decision No. 442 of the Minister of National Defence of 29.12.2009, is to execute *A program of prevention of intestinal parasitic diseases among soldiers of Polish Armed Forces assigned to an overseas tour of duty within the period 2010-2014*[17].

SUMMARY

Objective: The study presents the prevalence of intestinal protozoan infections with *Giardia intestinalis* diagnosed among Polish soldiers serving in the United Nations operation (MINURCAT) in eastern Chad, Central Africa.

Material and Methods: The material subjected to analysis was faecal specimens collected from 247 patients of Polish nationality aged 21 to 51, residing temporarily (6-month period, November 2008 – April 2009) in Sahel region. Three samples of faeces were collected from each patient. The samples were then analyzed in terms of incidence of water-borne infections caused by protozoan pathogens. Direct smear in Lugol's solution and preparation from decantation in distilled water were applied as the laboratory testing methods using a light microscopy.

Results: The analysis of faecal samples collected from 247 soldiers demonstrated 55 cases of giardiasis (*Giardia intestinalis*), giving a prevalence of 22.3 cases per 100 persons.

Conclusions: In Eastern Chad, a region where soldiers of the UN mission execute mandatory tasks, there is a high risk of developing of water-borne diseases. The source of parasitic infections are infected water reservoirs. Treatment of the infected cases and the introduction of health control measures are necessary to reduce the prevalence of giardiasis among soldiers. Intestinal protozoan infections pose a considerable health problem not only for peacekeepers but also for their relatives in country of origin, in cases of importing pathogens.

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