The Prevalence of *Blastocystis hominis* and Other Protozoan Parasites in Soldiers Returning from Peacekeeping Missions

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Abstract. *Blastocystis hominis* is a common intestinal parasite found in humans living in poor sanitary conditions, living in tropical and subtropical climates, exposed to infected animals, or consuming contaminated food or water. The aim of this study was to determine the prevalence of *B. hominis* in Polish military personnel returning from peacekeeping missions in Iraq and Afghanistan. In total, 1,826 stool samples were examined. Gastrointestinal parasites were detected in 17% of the soldiers. The examined stool samples most frequently contained vacuolar forms of *B. hominis* (15.3%) and cysts of *Entamoeba coli* (1.0%) or *Giardia lamblia* (0.7%). In 97.1% of stool samples from infected soldiers, we observed less than five developmental forms of *B. hominis* in the field of view (40×). The parasite infections in soldiers were diagnosed in the autumn and the spring. There was no statistical correlation between age and *B. hominis* infection. Our results show that peacekeeping missions in countries with tropical or subtropical climates could be associated with risk for parasitic diseases, including blastocystosis.

INTRODUCTION

Blastocystis hominis (Brumpt, 1912) is a unicellular protozoan found in the large intestine in humans.¹ It is currently the predominant parasite found in human stool samples, with a higher prevalence in developing countries (50–60%) than developed countries (about 10% or less).^{1,2} Highly polymorphic and consisting of many morphological forms, including vacuolar, non-vacuolar, granular, amoeboid, and cyst forms, *B. hominis* can be transmitted as a cyst by the fecal–oral route, particularly in poor hygienic conditions.^{1,3} It can be found both in immunocompetent and immunosuppressed individuals; for example, Abdel-Hameed and Hassanin⁴ found this parasite in 73.1% of immunocompetent patients and 26.9% of immunocompromised patients.

The epidemiology, life cycle, and pathogenesis of *B. hominis* are still poorly known.⁵ Although this protozoan is a non-pathogenic commensal, both *in vivo* and *in vitro* studies have shown its pathogenic power.^{6,7} In symptomatic patients, the clinical consequences of *B. hominis* infection include abdominal pain, nausea, vomiting, anorexia, flatulence, weight loss, and acute or chronic diarrhea.^{8,9}

In recent years, armed conflicts have been relatively frequent, especially in areas of the Middle East, during which peacekeepers are being exposed to multiple risks to their health and life, including gastrointestinal protozoan infections.¹⁰ The occurrence of parasitic diseases in soldiers is closely related to the epidemiological and sanitary/hygienic situation of the region where the troops are stationed. Likewise, *B. hominis* infection is associated with poor sanitation levels, tropical and subtropical climates, exposure to animals, and consumption of contaminated food or water. Therefore, the aim of this study was to determine the prevalence of *B. hominis* and other infections of protozoan parasites in soldiers returning from Middle Eastern peacekeeping missions.

MATERIALS AND METHODS

We examined stool samples from 913 Polish soldiers participating in peacekeeping missions, particularly in Afghanistan

and Iraq, in 2008–2010. Stool samples were collected and investigated by direct smear examination two times: one time before leaving and one time after returning. The soldiers were divided into six age groups: ages 16–20 (A1; *n* = 17), 21–30 (A2; *n* = 530), 31–40, (A3; *n* = 316), 41–50 (A4; *n* = 47), 51–60 (A5; *n* = 2), and 61–70 years old (A6; *n* = 1). The research was approved by the Bioethics Committee of the Pomeranian Medical University in Szczecin (KB-0012/58/12).

All stool samples from the soldiers were examined for intestinal parasites by Lugol iodine and formalin-ethyl acetate concentration according to the work by Garcia.⁶ These preparations were examined under both low-power (10×) and high-dry (40×) objectives. The results obtained were analyzed statistically using Statistica 9.0 software (StatSoft Inc.).

RESULTS

Gastrointestinal parasites were observed in 17% of the military personnel returning from peacekeeping missions. The stool samples most frequently contained vacuolar forms of *B. hominis* (15.3%) and cysts of *Entamoeba coli* (1.0%) and *Giardia lamblia* (0.7%). The majority of the *B. hominis* infections (99.3%) were not accompanied by other parasitic infections. Only one soldier had both *B. hominis* and *E. coli* cysts (0.1%). Data are presented in Table 1. We found no correlation between age and the prevalence of infection.

In 136 (97.1%) stool samples from the infected soldiers, less than five morphological forms of *B. hominis* were observed in the field of view (40×), whereas 4 (2.9%) of the stool samples contained five or more forms (Figure 1). Most of the infected soldiers were diagnosed in the fall (54.3%) and spring (24.3%). In winter and summer testing, the percentages of infected soldiers with *B. hominis* were lower: 9.3% and 12.1%, respectively.

DISCUSSION

In this study, 15% of the stool samples from the soldiers returning from peacekeeping missions in Afghanistan and Iraq contained vacuolar forms of *B. hominis*, and around 1% each of the stool samples contained *E. coli* or *G. lamblia* cysts. By comparison, Buczynski and others,¹⁰ who studied the Multinational Corps personnel stationed in Lebanon, reported infections with *Trichuris trichiura* (17%),

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TABLE 1

The prevalence of *Blastocystis hominis* infection in soldiers returning from missions in each age group

Age group	Prevalence of <i>B. hominis</i>	
	<i>n</i>	Percent
A1 (16–20 years; <i>n</i> = 17)	3	17.6
A2 (21–30 years; <i>n</i> = 530)	67	12.6
A3 (31–40 years; <i>n</i> = 316)	61	19.3
A4 (41–50 years; <i>n</i> = 47)	8	17.0
A5 (51–60 years; <i>n</i> = 2)	0	0
A6 (61–70 years; <i>n</i> = 1)	1	100.0
Total	140	15.3

Ancylostoma duodenale (16%), *G. lamblia* (15%), and *Ascaris lumbricoides* (9%).

A similar prevalence of *B. hominis* infection to this study had been found in Thai soldiers (15%) in one study,¹¹ whereas a higher prevalence of *B. hominis* infection had been observed in stool samples in 37%¹² of Thai soldiers in another study and 44%¹³ of military personnel as well as 36%¹⁴ of the local population of Honduras. The difference in prevalence of *B. hominis* infections between these populations may be caused by the different diagnostic methods used⁷ as well as the soldiers being stationed in different areas under different sanitary conditions.

In some studies the prevalence of *B. hominis* infection was higher in children than adults.^{15–17} However, in this study, we found no statistically significant relationship between age and *B. hominis* infection.

In the literature, when stool samples contained less than five forms of *B. hominis* in the field of view (40×), patients usually experienced no symptoms.¹⁸ In our study, most of the soldiers showed no gastric symptoms, which could have been caused by low parasitemia.

The occurrence of parasitic diseases in peacekeeping missions is closely related to the epidemiological and sanitary-hygienic situation of the region where the troops are stationed. This study shows that parasitic infection acquired through the fecal–oral route from contaminated water and food is still a significant problem among military personnel. Despite the prevalence of parasitic infections among the peacekeepers being low, mostly because of the effective preventative health program, peacekeeping missions in countries with tropical or subtropical climates are still associated with the risk of parasitic protozoan diseases, including blastocystosis.

FIGURE 1. The vacuolar form *Blastocystis hominis* in stool (40× magnification).

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