Short Report: Persistent and Untreated Tropical Infectious Diseases Among Sudanese Refugees in the United States

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Abstract. A comprehensive medical evaluation to identify persistent and untreated tropical infections among members of the Sudanese group “Lost Boys of Sudan” living in Atlanta, GA, was initiated. Medical examinations and laboratory testing including blood cell counts, liver function tests, stool studies for parasites, hepatitis B serologies, and serologic testing for Schistosoma spp., Strongyloides, and filariae were performed. Preliminary results showed a high prevalence of untreated active schistosomiasis and strongyloidiasis infections in this group, 5 years after their resettlement in the United States. In addition, we found that many of them were infected with onchocerciasis and hepatitis B. We suggest that based on these preliminary results, pre-departure presumptive treatment and/or testing algorithms need to address some of these persistent tropical infections.

Current estimates suggest that there are ~13 million refugees worldwide.1 As a reflection of the global trend for increasing migration of geographically displaced populations, immigration to the United States has progressively increased in recent decades.2,3 Notably, among the total number of US-bound refugees, there has been an increase in the percentage of African refugees from 8% in 1998 to 35% in 2005.2,4 The so-called “Lost Boys of Sudan,” named after Peter Pan’s band of orphans, were raised in precarious, resource-poor refugee camps in Ethiopia (1987–1991) and Kakuma, Kenya (1990–present). In 2001, the US State Department resettled ~3,800 of the Lost Boys in the United States.5

The Centers for Disease Control and Prevention (CDC) recently conducted a serologic evaluation of attendees to a Lost Boys reunion in 2004.2,3 A high prevalence of exposure to Schistosoma mansoni or Schistosoma haematobium (44%), and Strongyloides stercoralis (46%) was identified. Because these parasitic infections are known to persist for prolonged periods in the absence of adequate treatment, positive serologies indicate previously untreated persistent infections. Based on the findings, it was recommended that the Lost Boys receive presumptive therapy for schistosomiasis and strongyloidiasis with praziquantel and albendazole, respectively.2,3 Although the true risk of filarial infections in the Lost Boys was not evaluated by the CDC study, older epidemiologic data suggested the possibility of Loa loa infection in southern Sudan.4,5 Because rapid killing of microfilaria by ivermectin can lead to encephalopathy among those with high-level Loa loa microfilaraemia, albendazole has been suggested as the preferred agent in this population.2,4,6 The CDC study did not seek to identify other potential tropical infections.

We were therefore interested in conducting a descriptive analysis of persistent and untreated tropical infections among Sudanese refugees seen at our clinic. We conducted a medical evaluation in a descriptive non-randomized, convenience sample, searching for persistent infectious diseases of members of this Sudanese group presenting to our tropical medicine clinic. Thus far, we evaluated 44 (30%) of the ~150 Lost Boys living in Atlanta, GA, that have regularly been followed at our Tropical Medicine Clinic at Emory University.

All patients in our study were resettled in the state of Georgia after arriving in the United States between September and November 2001. All participants were evaluated at our clinic between July 2005 and December 2006. These patients underwent a complete history and physical examination along with laboratory evaluation performed at the CDC that included a complete blood cell count, liver function tests, stool studies for ova and parasites (three samples), and hepatitis B, Schistosoma, and Strongyloides serologies. All serum specimens were tested by Falcon assay screening test-enzyme immunosorbent assay (FAST-ELISA) using S. mansoni adult microsomal antigen (MAMA) and with S. mansoni and S. haematobium immunoblots prepared with MAMA or S. haematobium adult microsomal antigen (HAMA), respectively.7–9 The Strongyloides ELISA was performed with S. stercoralis antigen as previously described.10 Filarial serologies (ELISA for IgG and IgG4) were performed at the Laboratory for Parasitic Diseases at the National Institutes of Health, Bethesda, MD.11,12 Data analysis was carried out by evaluation of proportions and frequencies with the use of Epi-Info software (CDC, Atlanta, GA). The study was exempted by the Institutional Review Board of Emory University.

During the study period (July 2005 to December 2006), medical evaluations of the 44 of 150 Atlanta area Lost Boys, mean age 25 years, were completed. Of the 31 patients in whom we were able to obtain hepatitis B diagnostic serologies, 10 (32%) showed evidence of hepatitis B surface antigenemia (HBsAg). Among these patients, one subsequently died secondary to hepatitis B–associated hepatocellular carcinoma, three had evidence of chronic hepatitis B infection, and six had hepatitis B surface antigenemia.

Schistosoma serologies were performed in 42 of the 44 individuals evaluated. Of these, 27/42 (64%) tested positive by either ELISA and/or immunoblot assays. Of these, 21/27 (78%) tested positive for S. mansoni infection and 6/27 (22%) tested positive for S. haematobium. However, 6/21 (28%) individuals who were positive for S. mansoni serology were also

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co-infected with *S. haematobium*. All patients who tested positive were treated according to recommended guidelines.

In addition, 10 of 40 (25%) tested positive by serology (> 8 units) for *Strongyloides*, and of these, 5/10 (50%) had concomitant evidence of positive filarial serologies. Among the 38 individuals who underwent filarial serologic testing, 10/38 (26%) had positive serologies and 8/10 (80%) had concomitant positive IgG4 serologies (we did not obtain enough serum to be submitted for filarial testing in 6 individuals). Those with positive IgG4 serologic analysis also underwent ophthalmologic examination, and concentrated peripheral blood smears were conducted to identify potential microfilarial circulation. Results of all peripheral smears were negative for *Loa loa*, and no ophthalmologic evidence of *Loa loa* or *Onchocerca* involvement was identified. We felt that onchocerciasis was the most likely diagnosis. Skin snips were not conducted, but in support of the diagnosis of onchocerciasis, four of eight (50%) patients developed a Mazzotti-type reaction characterized by mild itching after the initial ivermectin dose. A history of dracunculiasis was elicited in two patients who had previously had an adult worm extracted from a lower extremity. Thus far, we have documented absence of HTLV-1 co-infection (by HTLV-1 ELISA serologic assay) among 4 of the 10 (20%) patients with strongyloidiasis.

In addition, intestinal protozoan infections were identified in some of the participants and treated according to expert recommendations: *Endolimax nana* (two), *Entamoeba histolytica* cysts and trophozoites (two), *Entamoeba histolytica* cysts (two), *Giardia lamblia* trophozoites (two), and *Blastocystis hominis* (three). One patient was diagnosed with *Taenia* spp. eggs in stools.

The world’s population is becoming increasingly mobile, and as they have done throughout history, infectious diseases are traveling alongside. As African populations continue to resettle in the United States, specific screening and treatment of tropical parasitic infections must remain a priority to prevent the morbidity and mortality associated with these diseases. Persistent tropical infections may play a role in their physical and emotional adjustment and in their group’s overall morbidity and mortality.

There is scant information on the epidemiology of untreated chronic infections in refugees with the exception of case series of the consequences of undetected infections. Because of the chronic course of untreated schistosomiasis and strongyloidiasis among this population of refugees, positive serologic analysis becomes relevant.

Pre-departure empirical single dose treatment with albendazole and pyrithiamine/sulfadoxine has been shown to prevent significant morbidity associated with intestinal parasites and malaria, respectively, among Barawan Somali refugees. There is, however, increasing evidence that, despite these pre-departure efforts, there is a high prevalence of untreated active parasitic infections among some other African refugees living in the United States, as shown by the preliminary results of our study. Schistosomiasis and strongyloidiasis, in particular, have been diagnosed many years after initial resettlement in the United States. Thus, we suggest that pre-departure presumptive treatment of some of these persistent and untreated parasitic infections may be warranted, particularly for schistosomiasis and strongyloidiasis.

In our study, we also documented a high prevalence of hepatitis B infection, higher than most other groups of refugees. However, given the small number of people tested in our study, it is not possible from this work to determine if this rate is reflective of the larger group of Sudanese refugees. However, our findings reinforce the practice that all refugees arriving from highly endemic areas for Sudanese refugees should be screened for hepatitis B carrier status. Furthermore, identifying those co-infected with hepatitis B and schistosomiasis is particularly important, because co-infection has been associated with accelerated damage to the liver.

Although we identified a high prevalence of *Strongyloides* infection as shown by positive serologic analysis, it is not completely clear if some of these represented cross-reactivity with the filarial serology. Given the absence of *Loa loa* co-infection, those with strongyloidiasis received treatment with ivermectin. We have not found HTLV-1 co-infection among the few patients with strongyloidiasis in whom we have been able to screen for this viral infection.

Based on our results, we do not believe that filarial testing should be routine in this refugee group. Nonetheless, filarial testing should be considered among those with signs and symptoms consistent with filarial disease such as chronic pruritus, chronic urticaria, eye disease, or eosinophilia. In addition, given the small number of patients in our study, we suggest that screening for loiasis is still recommended when prescribing ivermectin for presumptive treatment of strongyloidiasis. In our series, despite the fact that we did not perform skin snips to confirm a diagnosis of onchocerciasis, we considered this the likely diagnosis among those patients who had positive filarial serologies with a concomitant high-titer of IgG4 component and negative blood smears for *Loa loa*.

Physicians in the United States and other developed countries increasingly encounter geographically displaced populations in their clinical practices. Recommendations that stem from clinical experience in caring for diverse groups of refugees should continue to be incorporated into approaches of pre-departure or post-immigration health care. Guidelines are expected to be issued by the CDC in the near future that will make screening for refugees more uniform that will help tailor evaluations to specific populations.

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