ORIGINAL ARTICLE

Prevalence of untreated schistosomiasis among Sudanese refugees: "The Lost Boys of Sudan" in the United States

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Abstract

Background. The increase in global travelling also brings infections from endemic to non-endemic regions where diagnosis and treatment may be delayed.

Methods. From 2005 to 2008, 104 Sudanese refugees were evaluated to determine the prevalence of untreated schistosomiasis at the Tropical Medicine Clinic at Emory University in Atlanta, GA. Sera from 87 patients were screened using FAST-ELISA and antigen-specific immunoblots.

Results. Of the 87 patients screened, 44.8% were positive for schistosomiasis antibodies, including *Schistosoma mansoni* and *S. haematobium*.

Conclusion. Our study emphasizes the need for single-dose presumptive treatment of praziquantel among sub-Saharan refugees and long-term travelers.

Key words: schistosomiasis, untreated, refugees

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Introduction

Improvements in international travelling have spurred an increase in global migration. Additionally, there has been an increase in the percentage of geographically displaced populations into many countries, including the U.S. The percentage of African refugees resettled in the U.S. increased from 8% in 1998 to 35% in 2005.[1,2] As more refugees resettle into the U.S., screenings and presumptive treatment must be considered for these populations arriving from countries endemic for a variety of diseases.

Refugees represent a particularly vulnerable population to suffer the long-term consequences of previously undiagnosed and untreated latent infections within the realm of neglected tropical diseases (NTDs). Typically exposed to poor sanitation and lack of medical care, they are at risk of harboring chronic undiagnosed and untreated infections.[3] Of the NTDs potentially affecting refugees from Asia, Africa, and some regions of Latin America, schistosomiasis is particularly important. Schistosomiasis is a parasitic disease caused by trematode worms of the genus *Schistosoma*.[4] Five species, *Schistosoma mansoni*, *S. haematobium*, *S. intercalatum*, *S. japonicum*, and *S. mekongi*, infect humans causing disease as they reside in the abdominal veins of their vertebrate definite hosts.[5] Acquired infection occurs when there is contact with fresh water where the intermediate host, the snail, and cercarial larvae are present.[6] In the absence of adequate treatment, infection can progress to fibro-obstructive disease of the affected host tissues.[5] Globally, 207 million people have schistosomiasis, and 85% of those infected reside in Africa.[6] As populations travel from one country to another, there is an increased risk of importing infections from endemic to non-endemic areas where diagnosis may be delayed. Although many studies have been conducted to determine the prevalence of schistosomiasis in endemic countries, little is known about the prevalence of schistosomiasis among refugee populations, particularly in the U.S. In 2000, the U.S. State Department resettled ~3800 of the "Lost Boys of Sudan."[2] Named after the Peter Pan group of orphans, the Sudanese group was raised in precarious, resource-poor refugee camps in Ethiopia (1987-1991) and Kakuma, Kenya (1990-present). The Centers for Disease Control and Prevention (CDC) conducted a serological evaluation of the "Lost Boys of Sudan" for schistosomiasis and strongyloides in 2004. Investigators found a high prevalence of exposure to schistosomiasis (44%) among this group. Based on their findings, CDC recommended that Sudanese refugees receive presumptive therapy for schistosomiasis with praziquantel.[1,2] The U.S. state of Georgia is one of the several states participating in refugee resettlement. An estimated 2000 refugees from 41 countries were resettled in Georgia in 2009 with the highest concentration of refugees in the greater Atlanta area. We conducted a study to determine the prevalence of untreated schistosomiasis among Sudanese refugees seen at our Tropical Medicine Clinic at the Emory Midtown Hospital, Atlanta, GA.

Methods

Medical evaluation was conducted in a descriptive, non-randomized, convenience sample among 104 members of the "Lost Boys of Sudan" presenting to the Tropical Medicine Clinic at Emory University. All patients in the study were resettled in the state of Georgia after arriving in the U.S. between September and November 2001. All participants were evaluated in the clinic between July 2005 and July 2008. All patients underwent a complete history and physical examination along with laboratory evaluation performed at the CDC. All serum specimens for *Schistosoma* were tested by Falcon assay screening test-enzyme immunosorbent assay (FAST-ELISA) using *S. mansoni* adult microsomal antigen (MAMA), *S. mansoni* and *S. haematobium* immunoblots prepared with MAMA, or *S. haematobium* adult microsomal antigen (HAMA).[7-9] Stool and urine were also collected in 56 patients to search for eggs of *Schistosoma* spp. All patients who tested positive were treated

according to recommended CDC guidelines.[1] The study was exempt by the Institutional Review Board of Emory University.

Results

During the study period, a total of 104 Sudanese refugees were evaluated. *Schistosoma* FAST-ELISA and immunoblots were obtained on 87 (84%) of these subjects. Of these 87 subjects, 81 were male and 6 were female. The mean age was 27 years (range: 17-49 years). Approximately 38% of patients reported chronic abdominal pain. A total of 39 (44.8%) were positive for *Schistosoma* by immunoblot. Of these, 19 (21.8%) were positive for S. *mansoni* only, 7 (8%) were positive for *S. haematobium* only, and 13 (14.9%) were both positive for *S. mansoni* and *S. haematobium*. Only 2/56 (3.5%) patients who underwent testing in stools and urine demonstrated the presence of eggs of *Schistosoma mansoni*.

Discussion

Our study documents the prevalence of schistosomiasis among Sudanese refugees treated at Emory's Travel and Tropical Disease Clinic in Atlanta, GA. This particular population had extraordinary environmental exposures and thus shared a wide array of environmental exposures during their journey in Africa. From serological assays, prevalence was high (44.8%) and infection from *S. mansoni* (21.8%) was more common than *S. haematobium* (8%) among patients. Also, there was a significant co-infection of *S. mansoni* and *S. haematobium* (14.9%). Our study supports the high prevalence of schistosomiasis demonstrated by the 2004 study of the CDC, further emphasizing the need for presumptive treatment of schistosomiasis through the use of praziquantel for refugees from Sudan. Findings also reiterate the importance of presumptive treatment of the "Lost Boys and Girls of Sudan" for schistosomiasis infection and the need for adding praziquantel to pre-departure therapy of sub-Saharan African refugees as recommended by CDC. This recommendation may also apply to other refugee groups from highly endemic areas in sub-Saharan Africa.[10] The prevalence (44%) of schistosomiasis found among patients in our study is similar to the prevalence of schistosomiasis (44%) among the Sudanese refugees in a study conducted by CDC. Chronic abdominal pain was reported by 46% of the "Lost Boys and Girls of Sudan" since their resettlement in the 2004 study. Serological results indicated that the reported pain was not due to either schistosomiasis or strongyloidiasis and may be due to other conditions.[11] Similarly, chronic abdominal pain was also reported among 38% of patients in our study.

We believe that presumptive treatment should be an important public health strategy among those individuals with persistent and untreated schistosomiasis. However, we also learned that schistosomiasis may not be the cause of chronic abdominal pain in many of our patients. In fact, upon further clinical, radiographic, and laboratory evaluation, chronic abdominal pain was determined to not be associated with schistosomiasis or other physical conditions in many of the patients evaluated in our clinic. Refugee populations are often exposed to a variety of traumas including political persecution, civil war, famines, etc. and may experience conditions such as post-traumatic stress disorder during their resettlement.[12] Given the plight of the "Lost Boys and Girls of Sudan" prior to their resettlement in the U.S., it is possible that the chronic abdominal pain is somatic manifestation in many of them. This diagnosis should be made only by excluding other common causes of chronic abdominal pain and after receiving presumptive treatment for schistosomiasis and potential intestinal parasites. Limitations of the study included selection bias and low sensitivity of the FAST-ELISA test. Sudanese refugees seen at the clinic sought medical care for varied conditions and in many cases the source of their abdominal pain was likely unrelated to schistosomiasis. Testing by the FAST-ELISA used in our study had a sensitivity of 76.9% to detect

schistosomiasis compared to immunoblot testing and CDCs FAST-ELISA tests, which are 99 and 90% sensitive for *S. mansoni* and *S. haematobium*, respectively. Due to the lower sensitivity of the test used, the prevalence from our study may be an underestimate. Previous studies have also shown lower sensitivity of the FAST-ELISA compared to the FAST-ELISA used by CDC.[9]

As refugees continue to be resettled in the U.S. and in other countries, an increased awareness is needed for screening and treating imported infectious diseases to reduce the associated morbidity and mortality. The high prevalence of untreated schistosomiasis among sub-Saharan refugee populations as described in our study stresses the importance of presumptive treatment and screenings of refugees arriving from areas where parasitic diseases are endemic. We recommend that serologic screening for schistosomiasis include both the FAST-ELISA and immunoblot testing to improve sensitivity. Relying on commercially available test kits may miss the diagnosis confirmation for schistosomiasis. Moreover, the results of our study support the recommendation of the CDC to presumptively treat refugees or long-term travelers arriving from sub-Saharan Africa or other highly endemic areas for schistosomiasis with a single-day regimen. Use of praziquantel can dramatically decrease the number of refugees and travelers who may be at risk for undiagnosed schistosomiasis infection, particularly if serologic assays do not have a high sensitivity for providing definitive diagnosis. Through preventative measures and increased awareness by physicians of potential parasitic infections of patients arriving from endemic regions, morbidity and mortality attributed to parasitic infections among refugees and travelers may be reduced.

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