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Effects of Annual Mass Treatment with Ivermectin for Onchocerciasis on the Prevalence of Intestinal Helminths

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INTRODUCTION

twice per year IV therapy in northeastern Ecuador on STH. However, no studies have been done to look at the effect on the prevalence of STH following annual mass drug administration (MDA) with IV for onchocerciasis that occurs at approximately 40 million treatments per year in Africa. [24]

The use of annual IV distribution to prevent morbidity caused by onchocerciasis began in Imo state, Nigeria, in 1993 and reached statewide in 1995 following a national onchocereciasis assessment survey that showed high prevalence of onchocerciasis throughout much of southeastern Nigeria. [6, 25] This program was begun as a combined effort of the State Ministry of Health, the Lions Clubs, and the River Blindness Foundation. For a time it also received support from the African Program for Onchocerciasis Control (APOC). The distribution program is now run by the State Ministry of Health in conjunction with The Carter Center. Imo State is composed of 27 districts known as local government areas (LGAs). On the basis of the 1995 disease mapping for onchocerciasis, 18 of the 27 LGAs in Imo state receive annual IV therapy because onchocerciasis is a public health problem there. In affected villages,

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METHODS

Sampling methodology. From July to August, 2008, we performed a cross-sectional survey of STH prevalence in Imo state, Nigeria. We used a stratified sampling procedure to choose 40 villages, 20 treated and 20 untreated villages (

his/her name recorded. The child or child's guardian was instructed to put a walnut sized amount of feces (size showed with a rock) of his or her stool from the next morning into the collection cup using a wooden stick, which was provided. The child/guardian was also instructed to wash his/her hands

skewed toward low egg counts. For this reason, logarithmic transformation and geometric means were calculated for fecal egg density using antilog-1 where x = number of

untreated area (P = 0.07). Only light intensity *Trichuris* infections were seen in the treated areas, whereas 3 children (5.7%) had moderate intensity infections in the untreated area (P = 0.55). Heavy infections with hookworm occurred in 3.2% and 1.8% of children in the treated and untreated area, and moderate intensity infections occurred in 2.1% and 2.7% of children in the treated and untreated area (P = 0.77). Only one child was found to be infected with *S. mansoni*, none were infected with *Schistosoma hematobium.*

Preschool-aged. Among preschool-aged children, who had never received IV even in treated areas, there was a significant difference in the prevalence of infection with *Trichuris* in the treated (1%) compared with untreated areas (8%) (P = 0.019). The difference in the prevalence of *Ascaris* infection approached statistical significance (3% versus 10%, P = 0.051). There was no difference in the prevalence of hookworm infection (21% versus 27%, P = 0.30). Geometric mean egg counts per gram of stool among all children 2–4 years of age were higher in untreated versus treated MDA; this difference was significant for *Ascaris* and *Trichuris* but not for hookworm (*Ascaris*: 0.91 [95% CI 0.30–1.83] versus 0.24 [95% CI 0–0.59], P = 0.04; *Trichuris*: 0.39 [95% CI 0.12–0.73] versus 0.05 [95% CI 0–0.14], P = 0.01; hookworm: 2.44 [95% CI 1.30–4.14] versus 1.74 [95% CI 0.82–3.12], P = 0.36). The range of eggs per gram of stool in untreated versus treated areas was 0–18,648 for *Ascaris*, compared with 0–6,000 in the treated region, 0–312 versus 0–96 for *Trichuris*, and 0–624 versus 0–1,632 for hookworm. Three children had *Ascaris* infection of moderate intensity; one in the treated and two in the untreated areas, respectively (P = 1). The infections with *Trichuris* and hookworm were all of light intensity. There was one case of infection with *S. mansoni.*

Effects of ivermectin on the need for community treatment. From a community perspective, nearly all the villages required at least school-based therapy for hookworm;
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FIGURE 2.

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TABLE 3
Univariate and multivariate analysis of factors contributing to infection among SACs

untreated groups. Although we found a significant impact of ivermetin on the prevalence of *Ascaris* and *Trichuris*, there was no difference in the prevalence or intensity of infection with hookworm in the treated versus untreated areas. The lack of efficacy against hookworm, the STH most associated with causing anemia and intestinal inflammation, explains the lack of difference in growth parameters.

infection, we cannot be sure that the treated villages had the same initial prevalence and intensity of STH as the untreated villages. However, given the similar hookworm findings between areas, and the known properties of ivermectin against the STHs, we think our assumption that *Ascaris* and *Trichuris* levels were similar before IV interventions began is reasonable.

Further studies are indicated to determine if annual IV and albendazole will suffice to control STHs in IV-treated onchocerciasis areas where STH prevalence is > 50%, so averting the need to invest in an additional treatment round. In addition, preschool-aged children are at risk for STH infections and better studies and age appropriate drug preparations are needed to guide recommendations for STH treatment in this age group.

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