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Assessing the WHO 50% Prevalence Threshold in School-Aged Children as Indication for Treatment of Urogenital Schistosomiasis in Adults in Central Nigeria

Darin S. Evans,* Jonathan D. King, Abel Eigege, John Umaru, William Adamani, Kal Alphonsus, Yohanna Sambo, Emmanuel S. Miri, Danjuma Goshit, Gladys Ogah, and Frank O. Richards

The Carter Center, Atlanta, Georgia; The Carter Center Nigeria, Jos, Plateau, Nigeria; Plateau State Ministry of Health, Plateau State Secretariat, Jos, Nigeria; Nasarawa State Ministry of Health, Nasarawa State Secretariat, Lafia, Nigeria

Abstract.

Preventive chemotherapy with praziquantel is recommended in adults by the World Health Organization when prevalence of schistosomiasis in school-aged children (SAC) is ³ 50%. This study ascertained the value of this threshold in predicting prevalence and intensity of *Schistosoma hematobium* (SH) infection in adults in central Nigeria. We evaluated urogenital schistosomiasis prevalence in 1,164 adults: 659 adults in 12 communities where mean hematuria among SAC in 2008 was 26.6% and 505 adults in 7 communities where the mean hematuria among SAC in 2008 was 70.4%. No statistically significant differences were found between the two groups of adults in prevalence of hematuria, prevalence of SH eggs, or intensity of infections. We conclude that, in this setting, the SAC threshold is not useful for treatment decisions in adults. Given the increased risk of subtle morbidity or urogenital schistosomiasis as a risk factor for human immunodeficiency virus (HIV), more liberal treatment of adults with praziquantel is warranted.

INTRODUCTION

Current (2006) World Health Organization (WHO) guidelines for preventive chemotherapy (PCT) of Schistosomiasis call for targeted distribution of praziquantel (PZQ) based on the prevalence of the disease in school-aged children (SAC).¹ According to these guidelines, moderate-risk areas, where SAC prevalence is 10–49%, should limit mass PZQ treatment to SAC, whereas high-risk areas, with SAC prevalence of ³ 50%, should target both children and at-risk adults. At-risk adults who should receive PCT should range “from special groups (pregnant and lactating women; groups with occupations involving contact with infested water, such as fisherman, farmers, irrigation workers, or women in their domestic tasks) to entire communities

living in

We estimated that a total sample size of at least 434 adults per group would allow for the detection of a difference of 10% in prevalence among adults between groups with the following assumptions: 0.05% significance level, 90% power, 10% prevalence among adults in group 1, and a design effect of two to account for potential correlation among data within communities. To achieve the desired sample size, we aimed to examine all adults in all 21 communities. In each community surveyed, all households were listed and numbered according to geographic distribution as best as possible using the knowledge of village leaders. A random systematic sample of 24 households was selected from the list by calculating a sampling interval, taking a random starting household, and then selecting households from the list according to the interval. All adult residents in the community 20 years of age and older and present in selected households were assessed for urogenital schistosomiasis. After obtaining verbal consent, each adult was provided with a cup and asked to fill it with urine. Urine specimens were tested immediately for hematuria (rapid reagent strip test; Uripath by Plasmatec

We were unable to reach two communities during the survey (one in each group) because of civil unrest/security issues. Therefore, adults were examined from 11 of 12 moderate adult risk communities (group 1) and 8 of 9 high adult risk communities (group 2). A total of 1,164 adults were examined of 1,287 registered in the sample households (90% response rate): 602 adults in group 1 and 562 adults in group 2. Respondents were 54.4% female and had a mean age of 32.2 years (Table 1). There was no significant difference in group composition in either age or sex. Most respondents reported their occupation as farmers (39.6% surveyed versus 41% registered) or housewife (25.6% surveyed versus 25% registered). Although no significant differences between the two groups existed in occupation according to registers, significant differences among respondents were reported during the survey interviews: group 1 (moderate risk for adults) contained more business workers (11.3% versus 6.3%, $P < 0.01$) and civil servants (4.4% versus 1.8%, $P < 0.01$), whereas group 2 (high adult risk) contained more fishermen (1.9% versus 0.1%, $P < 0.01$). Residents in both groups were equally likely to participate in the survey (90.4% versus 90.5%, $P = 0.95$).

No statistical difference was observed in adults between the two groups for any of the infection indicators assessed: prevalence

Other factors affecting adult's infection status irrespective of risk groups 1 and 2 are shown in Table 3. Males were not more likely than females to have hematuria (OR = 1.2, 95% CI = 0.9–1.6, P = 0.248), but they were more likely than females to have infections (OR = 2.0, 95% CI = 1.4–2.9, P < 0.01). Young adults between 20 and 29 years had significantly higher rates of hematuria than older adults (OR= 1.2, 95%CI = 0.9–1.6, P < 0.05) but did not differ in infection rates (OR = 1.4, 95%CI = 0.96–2.1, P = 0.084). An individual adult's hematuria status was not associated with children in the sample household reporting having taken PZQ, presence of a latrine at the household level, and baseline SAC classification of the community in multivariate analysis.

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TABLE 3

General characteristics of total adult sample

DISCUSSION

We were unable to find any statistical difference in SH infection (hematuria, eggs in urine, or light or heavy infections) among adults living in communities above and below the critical SAC PCT indicator group threshold of 50% prevalence. Our results suggest that, in this particular setting in central Nigeria, the 50% SAC threshold does not predict greater numbers of adults living with high SH infection risk, because the high-risk prevalence (20%; 95% CI = 11.1–29.1%) and intensity of that does cause

and health education/behavioral change program. Additionally, the role of urogenital Schistosomiasis in human immunodeficiency virus (HIV) and possibly, human papillomavirus (HPV) infection has recently been recognized.⁹⁻¹² Disruption of the genital tract epithelium caused by *S. haematobium* eggs has been associated with increased risk for acquiring HIV infection. Some studies have suggested that the SH infection can result in increased viral loads of HIV or HPV, which could result in the increased ability of the infected persons to transmit these viruses to others.^{10,13}

A very interesting finding in our study was that the male occupations differed between the two groups in our study. Group 2 had more high-risk occupations (fishermen and farmers) than did group 1 (which had more businessmen and civil servants). However, SH infection rates were not different. This finding goes against many studies, which show clear associations of infection with water exposure associated with fishing and farming.

There are several limitations to this study. One limitation was that our methods for determining intensity of infection examined one-half (5 mL urine) of the WHO-recommended 10 mL. In our analysis, we corrected for the WHO standard of light and heavy infections (1–49 eggs/10 mL and ³ 50 eggs/ 10 mL, respectively) by adjusting our standards by one-half. This adjustment could potentially affect the number of light (in particular) or heavy infections found, but it would not affect or bias our ability to compare our findings between the two groups.

The lower-limit WHO thresholds for initiating mass drug administration among SAC changed during the course of our work in Nigeria, decreasing from 20% in 1997 to 10% in 2006. As a result, our baseline data were for the 20–50% strata rather than the current 10–50% cutoff. Conceivably, adding the 10–19% communities could have resulted in lowering the infection rates among adults in the moderate-risk group.

communities with ³ 20% SAC prevalence. This SAC threshold gradually decreased to ³ 10% in 1999, ³ 5% in 2000, ³ 3.5% in 2002, and ³ 3% in 2003.¹⁹

In January of 2012, Merck KGaA (E-Merck) pledged to increase its PZQ donation from 50 million to 250 million

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