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Urogenital schistosomiasis and urological assessment of hematuria in preschool-aged children in rural communities of Nigeria

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Abstract *Objective:* The study evaluates the prevalence of urogenital schistosomiasis and diagnostic performance of chemical reagent strips used for disease diagnosis in preschool-aged children (≤5 years) in Nigeria rural communities.
Patients and methods: Urine samples from 419 children were observed microscopically for *Schistosoma haematobium* and screened for hematuria using standard urine chemical reagent strips.
Results: Prevalence and intensity of infection were 9.8% and 14.4 eggs/10 ml of urine, respectively. Prevalence of infection was similar in girls (10%) and boys (9.6%) ($p > 0.05$). The intensity of infection was higher in boys (17.1 eggs/10 ml of urine) than in girls (12.8 eggs/10 ml of urine); however, this was not gender dependent ($p > 0.05$). The occurrence of hematuria was not associated with gender ($p > 0.05$), but was associated with prevalence of infection ($p < 0.05$).
Conclusion: Infection with *S. haematobium* occurs early in life in the communities and although intensity of infection is low, it could have serious implications in disease transmission. Hematuria, although moderately sensitive to infection, is an important morbidity indicator of urogenital schistosomiasis in the study population.

Introduction

Schistosomiasis remains a major public health problem in many parts of the developing world [1] and being a neglected tropical parasitic disease, the disease seems to have lost priority in the global health agenda. This is unfortunate as 50.8 million individuals aged ≤20 years in West Africa are infected with either *Schistosoma mansoni* or

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Schistosoma haematobium, or both species concurrently [2].

Occurrence of schistosomiasis in human populations has been widely reported in Nigeria [3–5]. These studies were, however, often targeted at school-aged children. In Nigeria and other parts of the world, preventive chemotherapy interventions with the anthelmintic praziquantel are principally targeted towards treatment of school-aged children (6–15 years old) and/or adults (>15 years old) in high-risk occupational groups. In some situations, treatments are targeted, often using school-based resources, towards those who harbor the greatest bulk of parasites [6].

Exclusion criteria against the treatment of preschool-aged children, that is children aged 5 years and below, was based on the belief that these children are not sufficiently exposed to infective water to experience high infection rates [6], which would lead to the clinical manifestation of disease, and the lack of safety data on administration of praziquantel in this age group [7]. Preschool children comprise between 10% and 20% of the 3.5 billion people living in schistosomiasis endemic areas [8]. Urogenital schistosomiasis among children in other parts of the world has been associated with poor nutritional status [9]. In Nigeria, these categories of children usually accompany their mothers to water contact sites and are very often left to play with or bathe in the river water. Thus preschool children can both be at risk of infection and a potential reservoir for the parasite in communities successfully targeted by mass anthelminthic treatment [10].

Rapid and indirect diagnostic methods have been suggested to aid quick mapping surveys in endemic regions [11]. This becomes important as rapid detection of diseased individuals is necessary for efficient intervention through mass drug administration in the areas. Some of the notable indicators of infection, especially by *S. haematobium*, for rapid assessment are hematuria, proteinuria and leukocyturia. Hematuria has been the most widely studied indicator in endemic areas with high sensitivity to *S. haematobium*.

Until recently, studies on urogenital schistosomiasis among infants and preschool children were scarce in Nigeria. Urogenital schistosomiasis infections have been reported in preschool children in settlements in Adim, Cross River State and Ilewo-Orile, Ogun State, all in Nigeria [12,13]. These studies were often based on established information of high degree of human-water contact activities in these age groups. As such, the result of prevalence may not be adequate in planning an effective control program on a larger scale. The study therefore examined the prevalence of urogenital schistosomiasis among preschool children in Yewa North LGA, Ogun State to provide baseline information for mass drug administration in the area. The diagnostic accuracy of hematuria, an associated morbidity of infection, is also studied.

Yewa North LGA has the largest land area in the Ogun State, Nigeria and is located at latitude 7° 15′ N and longitude 3° 3′ E in a deciduous/derived savannah zone. The 2005 population projection of the State Demographic indicators showed that the population size was 232,236. The LGA has 11 wards: Ayetoro I, Ayetoro II, Ayetoro III, Igbogila, Ijoun, Sunwa, Imasai, Eggua, Joga/Iboro, Ohunbe and Ebute. It shares boundaries with Imeko-Afon LGA in the North, Yewa South LGA in the South, Republic of Benin in the West and Abeokuta North and Ewekoro LGAs in the East. The people are mainly Yorubas speaking various dialects. There are many natural flowing rivers in the area, some of which include Yewa, Orori, Bareke, Iju and Iyaniwura rivers. Snail intermediate hosts of schistosomes have been sampled from the water bodies [14]. There is heavy dependence on these rivers for domestic purposes as a result of inadequate water supply in the area and various human-water contact activities like bathing, swimming, washing and fetching are common.

Patients and methods

The cross-sectional descriptive study adopted a random sampling method to recruit preschool children. The subjects were drawn from eight wards randomly selected from the total of 11 wards in the LGA. The sample size was determined by the method of Daniel [15]. Children in their first year of life were considered as infants, while any child between the age of 1 and 5 years (i.e. between the 1st and the 5th birthday; mean age = 4.2 ± 1.1 years) was considered a preschool child irrespective of his/her school enrolment status. Kindergarten pupils (age 3–5 years) from eight randomly selected primary schools and younger children recruited at the Primary Health Clinic Centers were invited to participate in the study. A preliminary pilot study was conducted to determine the prevalence or proportion of population infected. This included 30 infants and preschool children randomly selected from across the wards in the study area. The prevalence of urogenital schistosomiasis was 6.7% and precision used to calculate the sample size was 5% (0.05). A statistical power of 80% was used for the sample size determination.

The Joint Ethical Review Committee of the University of Ibadan/University College Hospital, Ibadan, Nigeria granted approval to this study. A pre-survey visit was made to the study area, during which time discussion was held with the community heads and the primary health care workers who assisted in mobilizing the people for the study. Participation of children was dependent on written consent from their parents. Children that were not resident in the study area and visitors were excluded from the study.

Pre-labeled screw-capped plastic containers for urine collection were given to 450 participants with their demographic information recorded against their numbers. The freshly passed mid-day urine samples (collected between 10 and 14 h) of 419 subjects were inspected macroscopically for macrohematuria and then screened for microhematuria using commercially available urine reagent strips (Medi-Test Combi 9®, Neumann-Neander-Str. 6-8. D-52355 Düren). The strip testing was performed in accordance with the manufacturer's instructions. The diagnostic performance of urine indicators of *S. haematobium* infection was determined. Each of the samples was well mixed and 10 ml drawn using clean, sterile plastic syringes into centrifuge tubes. Centrifugation was done at 5000 g for 5 min. The supernatant was removed using dropping pipettes and the sediments were viewed under a light microscope for the presence of terminal spined *S. haematobium* eggs. Intensity of infection was classified as light infection (≤50 egg/10 ml of urine) and heavy infection (>50 eggs/10 ml of urine)