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# No Association between Urogenital Schistosomiasis and HIV Infection among Children in Ore Community, Southwestern Nigeria

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### Authors' contributions

This work was carried out in collaboration among all the authors. Authors CI and OO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SAA, AAA and DEI managed the analyses of the study. Author JMO managed the literature searches. All authors read and approved the final manuscript.

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## ABSTRACT

**Aim:** To determine if there was any association between urogenital schistosomiasis and HIV infection among children in Ore Community, Southwestern Nigeria.

**Methodology:** Urine samples were collected from 438 children and examined microscopically for ova of *Schistosoma haematobium*. A sample of 3 ml of blood was drawn from each participant for HIV test. Antibodies to HIV were determined using Determine HIV1/2 kit, Unigold kit and enzyme

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linked immunosorbent assay (ELISA).

**Results:** The overall prevalence of *S. haematobium* infection was 30.1% while that of HIV infection was 0.9%. None of the 132 *S. haematobium* infected children had HIV infection while 1.3% of the 306 children negative for *S. haematobium* were positive for HIV test.

**Conclusion:** This study did not identify an association between urogenital schistosomiasis and HIV infection among children in Ore, Southwestern Nigeria. Therefore, urogenital schistosomiasis may not play a significant role in the spread of HIV infection in a locality where HIV prevalence is low.

**Keywords:** Urogenital schistosomiasis; HIV infection; children.

## 1. INTRODUCTION

Schistosomiasis is a human chronic disease caused by the blood flukes *Schistosoma* spp. namely *S. haematobium*, *S. mansoni*, *S. japonicum*, *S. mekongi* and *S. intercalatum* [1]. Of the five species causing schistosomiasis, *S. haematobium* is the most common [2]. About 249 million people are estimated to have schistosomiasis globally, 90% of which live in sub-Saharan Africa and children are mainly affected [1,3].

Like schistosomiasis, HIV is one of the most common infections in the world and sub-Saharan Africa has the highest prevalence of HIV infected persons [4]. In sub-Saharan Africa, it is reported that close to 1000 new cases of children are infected daily and more than 2.5 million children less than 15 years have HIV/AIDS, many of whom present late for management and treatment of the disease [5].

Schistosomiasis and HIV in sub-Saharan Africa are believed to often overlap resulting in persons harbouring co-infections [1,6,7,8]. In Nigeria, schistosomiasis is endemic with an estimated 29 million people infected and about 101 million people are at risk of the infection [9-12]. Similarly, Nigeria has the second largest HIV epidemic in the world and has one of the highest new infection rates in sub-Saharan Africa; however, many people living with HIV including children are unaware of their status due to the country falling short in providing the recommended number of HIV testing and counselling sites [13].

The epidemiology of *S. haematobium* infection depends on the presence of intermediate snail host and human water contact patterns [14]. Studies have shown that its prevalence ranges from moderate to high in Southwestern Nigeria [15-18]. Children of school age are known to be more susceptible to urogenital schistosomiasis due to their more frequent contact with infested

water [14]. On the other hand, although HIV infection prevalence among children is not known, it is expected to be moderate since that of adults has been put within the range of 15-28% [1,8] and considering the fact that HIV infection in children is essentially by vertical transmission [8]. Presently, we are not aware of reports on the association between schistosomiasis and HIV infection in Nigeria. In this study, we examined if there was any association between urogenital schistosomiasis and HIV infection among children in Ore community, Southwestern Nigeria by comparing the prevalence of urogenital schistosomiasis with that of HIV infection.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study area was Ore community, in Odo-Otin Local Government Area of Osun State, Nigeria. Ore is about 20 km from Osogbo, Osun State Capital. It is located in the rainforest zone and has a population of approximately 2,000. This study was carried out among pupils in primary schools in Ore community. A total of 438 primary school pupils (3-14 years) participated in the study. Questionnaires were administered on each subject to collect relevant information such as age and sex.

### 2.2 Ethical Issue

The consent of the parents and guardians of the children was obtained. The permission of the community leaders and school authority was obtained before the commencement of the study. Ethical approval for this study was obtained from the Ethical Committee of the Ministry of Health, Osogbo, Osun State.

### 2.3 Parasitological Survey

Each child was given a clean universal bottle for collection of urine between 11:00 and 14:00

hours. Urine samples collected were immediately transported to the laboratory for examination. Briefly each urine sample was thoroughly mixed and 10 ml was centrifuged at 1000 g for 3 minutes. The supernatant was decanted and the sediment examined under the microscope for eggs of *S. haematobium*. The eggs were counted using a tally counter and intensity of infection recorded. Intensity of infection was classified as light (<50 eggs/10 ml urine) and severe or heavy ( $\geq 50$  eggs/10 ml urine) [19].

## 2.4 HIV Serological Screening

From each participant, 5 ml of venous blood was collected into plain bottle for HIV testing. Antibodies to HIV were verified using Determine HIV1/2 kit (Abbott Diagnostic Division, Hoofddorp, The Netherlands), Unigold or stat pak and Enzyme linked Immunosorbent Assay (GenScreen plus HIV Ag-Ab test kit, Pasteur, Paris).

## 2.5 Statistical Analysis

The statistical package for social sciences (SPSS) was used for statistical analysis. Differences between percentages/proportions were tested by Chi-square and Yates' Chi-square. A p-value of < 0.05 was considered to be significant.

## 3. RESULTS

Table 1 shows the baseline characteristics of the study population. The overall prevalence of *S.*

*haematobium* infection was 30.1% while that of HIV infection was 0.9%. The prevalence pattern of *S. haematobium* showed an increasing trend with increasing age, and peaked around 12 to 14 years. The lowest prevalence of 11.3% was recorded among the children aged 3 to 5 years. There was a significant difference in prevalence of infection with respect to age ( $p < 0.001$ ). However, there was no statistically significant difference ( $p = 0.15$ ) in prevalence between the boys 78(33.1%) and girls 54 (26.7%) (Table 2). The overall mean intensity of infection was  $34.4 \pm 5.3$  eggs/10 ml. Children aged 3 to 5 years had the lowest intensity of  $12.3 \pm 3.5$  eggs/10 ml while the highest mean intensity of  $46.3 \pm 15.4$  eggs/10 ml was recorded in pupils aged 6 to 8 years. The male pupils had a higher intensity ( $36.4 \pm 7.7$  eggs/10 ml) than the female pupils ( $31.5 \pm 6.7$  eggs/10 ml) but the difference was not statistically significant ( $p = 0.32$ ). Similarly, no statistically significant difference was observed between age and intensity of infection ( $p = 0.65$ ).

**Table 1. Baseline characteristics of the study population in ore, southwestern Nigeria**

| Subject's characteristics                        | Number (%) |
|--|------------|
| Number of subject studied                        | 438        |
| Male: Female                                     | 236:202    |
| Age range (years)                                | 3-14       |
| Subjects positive for Urogenital Schistosomiasis | 132 (30.1) |
| Subjects positive for HIV                        | 04 (0.9)   |

**Table 2. Prevalence and intensity of Urogenital Schistosomiasis by age, sex and Macrohaematuria among the study population in Ore, Southwestern Nigeria**

| Variable               | No. examined (%) | No. infected (%) | Intensity/ Mean $\pm$ SEM |
|------------------------|------------------|------------------|---------------------------|
| <b>Age, years</b>      |                  |                  |                           |
| 3-5                    | 106 (24.2)       | 12 (11.3)        | 12.3 $\pm$ 3.5            |
| 6-8                    | 126 (28.8)       | 32 (25.4)        | 46.3 $\pm$ 15.4           |
| 9-11                   | 66 (15.0)        | 28 (42.4)        | 25.2 $\pm$ 5.3            |
| 12-14                  | 140 (32.0)       | 60 (42.9)        | 36.8 $\pm$ 8.0            |
| Total                  | 438 (100.0)      | 132 (30.1)       | 34.4 $\pm$ 5.3            |
| p-value                |                  | <0.001           | 0.32                      |
| <b>Sex</b>             |                  |                  |                           |
| Male                   | 236 (53.9)       | 78 (33.1)        | 36.4 $\pm$ 7.7            |
| Female                 | 202 (46.1)       | 54 (26.7)        | 31.5 $\pm$ 6.7            |
| Total                  | 438 (100.0)      | 132 (30.1)       | 34.4 $\pm$ 5.3            |
| p-value                |                  | 0.15             | 0.65                      |
| <b>macrohaematuria</b> |                  |                  |                           |
| Present                | 35 (8.0)         | 29 (82.9)        | 79.8 $\pm$ 18.2           |
| Absent                 | 403(92.0)        | 103 (25.6)       | 21.6 $\pm$ 3.7            |
| Total                  | 438 (100.0)      | 132 (30.1)       | 34.40 $\pm$ 5.31          |
| p-value                |                  | <0.001           | <0.001                    |

**Table 3. Prevalence of HIV infection by sex and age among the study population in Ore, Southwestern Nigeria**

| Variable           | No exam     | No infection with HIV (%) |
|--------------------|-------------|---------------------------|
| <b>Sex</b>         |             |                           |
| Male               | 202 (44.5)  | 00 (0.0)                  |
| Female             | 236 (55.5)  | 04 (1.6)                  |
| Total              | 438 (100.0) | 04 (0.9)                  |
| <b>Age (years)</b> |             |                           |
| 3-5                | 106 (24.2)  | 01 (0.9)                  |
| 6-8                | 126 (28.8)  | 00 (0.0)                  |
| 9-11               | 66 (15.0)   | 01 (1.5)                  |
| 12-14              | 140 (32.0)  | 02 (1.4)                  |
| Total              | 438 (100.0) | 04 (0.9)                  |

**Table 4. Frequency distribution of urogenital schistosomiasis and HIV infection among the study participants in Ore, Southwestern Nigeria**

|               | Urogenital schistosomiasis |            |             |
|---------------|----------------------------|------------|-------------|
|               | Positive                   | Negative   | Total       |
| HIV infection |                            |            |             |
| Positive      | 00 (0.0)                   | 04 (1.3)   | 04 (0.9)    |
| Negative      | 132 (100.0)                | 302 (98.7) | 434 (99.1)  |
| Total         | 132 (30.1)                 | 306 (69.9) | 438 (100.0) |

Among the 35 individuals who had macrohaematuria, 82.9% were infected with *S. haematobium* while 25.6% of the 403 individuals without macrohaematuria had urogenital schistosomiasis. Macrohaematuria was significantly associated with *S. haematobium* infection ( $p < 0.001$ ) and its intensity ( $p < 0.001$ ). Table 3 shows the prevalence of HIV by age and sex among the study population. While none of the 202 girls was positive for HIV test, 1.6% of the 236 boys were positive for HIV test. There was no significant association between HIV infection and sex (Yates'  $p = 0.18$ ). Table 4 shows the frequency distribution of urogenital schistosomiasis and HIV infection among the study participants. None of the 132 *S. haematobium* infected children had HIV infection while 1.3% of the 306 children negative for *S. haematobium* were positive for HIV test. There was no significant association between the two infections (Yates'  $p = 0.44$ ).

#### 4. DISCUSSION

The present study examined the prevalence of urogenital schistosomiasis together with that of HIV among children in Ore community, Southwestern Nigeria. The overall prevalence rate of *Schistosoma haematobium* infection was

30.1% which showed that Odo-Otin LG fell within the WHO classification of moderate prevalence [2]. The prevalence in the present study was similar to some reports across Nigeria where *S. haematobium* had been found to be moderately endemic [20-23]. In contrast, the result obtained in this study was lower than other reports which recorded high endemicity [15,16,24,25]. The differences could be explained by differences in ecological factors that could in turn lead to differences in infection intensity. One distinguishing feature of this infection is that it has focal distribution and so its prevalence varies across a region or country [2].

Owing to differences in behaviour that affect the rate of contact with cercariae infested water, the magnitude of prevalence and intensity of *S. haematobium* infection is expected to vary with age and sex [26]. In the present study, the prevalence of *S. haematobium* infection increased with the age of the participants, and children in the 12 to 14 years age range were the most infected group. This finding was consistent with previous reports from different endemic communities [1,16,27,28]. This could be explained by the fact that children of this age are quite mobile and often go to the fields near the canals either to assist their parents or guardians in agricultural activities, domestic chores such as

washing of clothes or to swim and play in the canals, which are contaminated with the infective stages of schistosomiasis. Moreover, there are reports of a high prevalence of *S. haematobium* infection among children who acquire the infection by being frequently exposed to fresh water containing the infective stage of the disease [29].

In this study, the prevalence of infection was higher among the male pupils (33.1%) than in female pupils (26.7%), however, no statistically significant difference in the prevalence of infection between both sexes was observed. Also, the intensity of infection was not sex-dependent suggesting that male pupils carried similar worm burden as female pupils. This is presumably due to equal exposure to the risk factor as there were no restrictions on movement and contact with the freshwater habitat in terms of culture, religion or sex. Some previous studies had also reported similar prevalence and intensities between boys and girls [17,18] while some had reported higher prevalence among male pupils than among their female counterparts [15,22,30]. Where both male and female children had equal chances of contact with infested water bodies, there would be no sex difference in infection rate and worm burden. However, where male contact with infested water was higher, boys had more infection rate and greater worm burden than girls.

The prevalence of HIV infection among children in this locality was low based on 0.9% reported in this study. Since acquisition of HIV infection in children is mainly by vertical transmission, its prevalence among adults in this study area would certainly be low. This is supported by the current national HIV data, based on seroprevalence among pregnant women attending government health facilities which puts the prevalence of HIV infection in Osun State where this study was carried at 1.6% [31]. This low prevalence of HIV infection in the study population would not permit any association with *S. haematobium* infection.

## 5. CONCLUSION

Co-infection of urogenital schistosomiasis and HIV infection in this study was zero. This lack of association between the two infections might not be unconnected with the low prevalence of HIV infection. Therefore, urogenital schistosomiasis may not play a significant role in the spread of

HIV infections in population where HIV prevalence is low.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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