Urinary Schistosomiasis Among School-age Children in Selected Local Government Areas in Ogun State, Nigeria

Tajudeen O. O. Uthman[1,2,*], Olufemi M. Agbolade[1], Monsurat T. Okeowo[2]

1. Department of Zoology and Environmental Biology, Olabisi Onabanjo University, Ago-Iwoye, Ogun State. Nigeria

2.Department of Biological Science, Tai Solarin University of Education, Ijagun, Ogun State, Nigeria

*Corresponding author: deencrown41@gmail.com

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ABSTRACT

Schistosomiasis is the most common parasitic disease in the world caused by digenetic blood trematode worms of the family *Schistosomatidae*. It is one of the most prevalent neglected tropical diseases and the second most important human parasitic disease in the world, after malaria. Over 700 million people worldwide are at risk of infection, most of whom live in sub-Saharan Africa. While, children are especially vulnerable to the disease, Ogun State was rated as the most endemic state for schistosomiasis infection in Nigeria. Therefore, the epidemiology of Urinary Schistosomiasis among School-age children in Ogun State was conducted in this study. Midday urine samples were collected from 1,812 school-age children from ten selected Local Government Areas in Ogun State and were examined for the presence of haematuria (blood in urine) and *Schistosoma haematobium* ova. Out of the 1812 school-children examined, 92 (5.1%) tested positive for haematuria and 455 (25.1%) also tested positive for the presence of Schistosome ova. The highest infection prevalence rate (12.9%) was among female students infected with the parasite. The age group 10-12years had the highest rate of infection (12.2%), while the group 4-6 years had the lowest (1.3%) in the study areas. Therefore, urinary schistosomiasis is a major disease of major public health concern in Ogun State that requires prompt attention from relevant government and non-governmental agencies.

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1. Introduction

Schistosomiasis is an infection caused by digenetic blood trematode worms of the family Schistosomatidae [1]. After malaria, the World Health Organization (WHO) classified the disease as the second most important human parasitic disease in the world, [2]. In developing countries, schistosomiasis ranked among the six most serious public health problems. Over 200 million persons were affected in an estimated population of 600 million in more than 74 countries [3]. About 700 million persons worldwide are estimated to be at risk of schistosomiasis infection [4]. More than 90% of the infection population was found in sub-Saharan Africa, while about 150,000 deaths are recorded annually in Africa from schistosomiasis [5]. Africa has about 85% of the most severely affected people which are concentrated in and widespread across the continent, while 19.1% of Nigeria's population is reportedly exposed to schistosomiasis infection [6]. Ezeh *et al.* (2019) [7] rated Ogun State as the most endemic state for schistosomiasis infection in Nigeria. The trend and scale of the disease burden in the Sub-Saharan Africa varies with marginalized and impoverished environments having the highest infection rates [8]. These populations are identified with limited access to clean water, low socio-economic status as well as adequate sanitation. Although schistosomiasis is treatable and preventable, but it can lead to debilitating clinical complications such as bladder ulceration and deformities, infertility, kidney blockage as well as liver and spleen enlargement when left untreated [9]. People working in contact with natural water bodies especially women and children continue to be at great risk of schistosomiasis infection across Sub-Saharan Africa [10]. Houweling *et al.* (2016) [8] reported that there would be ultimate reduction in the population prevalence of schistosomiasis when maximum prevention is achieved among these susceptible groups as this can reduce the transmission rate among the general population. Lack or inadequate knowledge, negative beliefs and attitudes about the disease, poor sanitation and risky water practices have been attributed to the increased risk of infection among those groups in countries across Sub-Saharan Africa. Redekop *et al.* (2017) [11] also observed that low educational status among women to be an important predictor of infection. The first signs after infection are rashes or itchy skin. Following these reactions after infection are fever cough, chills, and muscle aches may develop as the parasites mature. Blood in urine or stool as well as enlarged liver and spleen can be resulted due to untreated infection [12]. The current control method employed in the majority of endemic areas includes targeted snail control, environmental alteration, large-scale periodic administration of praziquantel to humans and health education [13]. According to Torres-Vitolas (2021) [14],

such intervention programs in the delivery of healthcare in sub-Saharan African nations were hampered by challenges like poverty, ignorance, and poor hygiene standards. Considering the great economic importance of schistosomiasis and the threat the disease constitutes to humans, especially among school-age children, many studies had been carried out on urinary schistosomiasis by researchers and several intervention programmes had been put in place by several concerned agencies. Meanwhile, there is need to re-establish the present prevalence and epidemiological status of the disease in Ogun State since the state has been reported as the most endemic in Nigeria. Hence, the objective of this study is to examine the epidemiology of urinary schistosomiasis among school-age children selected Local Government Areas in Ogun State, Nigeria.

2. Materials and methods

2.1 Study Area

The study was conducted in ten selected Local Government Areas (LGAs) across the three geo-political zones in Ogun State, Nigeria. Ogun State falls in the tropical rainforest zone and is inhabited by the Yoruba race of the Nigerian Southwest community. Ogun State is bordered to the north by the states of Osun and Oyo, to the south by Lagos State, to the west by the Republic of Benin, and the east by Ondo State. It falls within the coordinates 6.9980° N, 3.4737° E. It has twenty LGAs with an approximate population of 3.7million people [15]. The ten LGAs selected for the study are Abeokuta North, Ado-Odo/Ota, Ifo, Ijebu North, Ikenne, Imeko/Afon, Odeda, Ogun Waterside, Remo North and Yewa North.

2.2 Sampling population

A cross-sectional study was carried out among school-age children in the selected LGAs in Ogun State, Southwest region of Nigeria. School children between age 5 to 15 were recruited for the study. Six schools (3 primary and 3 secondary) were visited in each of the LGAs and a population of 50 pupils were sampled in each school. A sample size of 50 students was thus chosen from each of the six schools in each LGA, yielding a combined sample size of 3,000 students from the 10 chosen LGAs.

2.3 Ethical Statement

Approvals were received from the Ogun State Ministry of Health and the Ogun State Ministry of Education, Science, and Technology. Following the Ogun State Ministry of Education,

Science, and Technology's instruction, an informed consent form was used to secure each participant's parent's approval through the heads of the chosen schools. The objectives and methods of the study were thoroughly described to the participants in the schools while obtaining their agreement in the native Yoruba language

2.4 Urine samples Collection

Urine sampling was carried out in the study area between June and September, 2018. For the mid-day urine sample collection, each participant was given a pre-labeled, screw-capped, wide-mouthed container. Samples were taken between 9:00 am and 12:00 noon, which coincides with the time of day when infected people are expected to release the greatest number of eggs [16].

2.5 Examination of urine for microhaematuria

Combi 9 urinalysis Medi-test strip (a chemical reagent strip manufactured by Analyticon Biotechnologies, Germany) was carefully dipped for 5 seconds into each urine sample that had been collected. When the manufacturer's color chart and the subsequent change in color of the strip were compared, the amount of blood in the urine was evaluated [17].

2.7 Examination of Urine for *Schistosoma* eggs

The evaluation of the urine samples was conducted using the sedimentation method as described by Cheesbrough [18]. 10ml of the urine sample from each specimen bottle was transferred using a sterile disposable syringe into a centrifuge tube, where it was spun at 3,000 rpm for 5 minutes. The supernatant was decanted while the sediment was re-mixed by tapping the bottom of the tube and little drop placed on a slide. Using x10 and x40 objectives, this was covered with a cover slip before being viewed under a microscope. Eggs of *S. haematobium* were identified and distinguished by their presence of a terminal spine. The remaining samples went through the same procedure once more. This was covered with a cover slip and examined microscopically, *S. haematobium* eggs are detected and distinguished by their presence of a terminal spine using x10 and x40 objectives. For the remaining samples, this procedure was repeated.

A Millipore filter paper (12 m polycarbonate filter) was used to filter 10 ml of each urine sample. The residue was examined using an x10 objective. According to WHO, [19], the number of eggs per filter was counted and the infection intensity was categorized as light (50 eggs/10 ml of urine) or heavy (50 eggs/10 ml of urine).

2.8 Statistical analysis

The relationships between variables were determined in simple percentages and the data collected was subjected to the Chi-square test. Descriptive statistics was used to describe categorical variables. Using one-way ANOVA, values of $P \leq 0.05$ was defined as statistically significant.

3. Results

3.1 Distribution of Respondents

The study was conducted in ten LGAs in Ogun State. One thousand eight hundred and twelve (1812) respondents were examined across the selected LGAs in Ogun State. Table 1 shows the distribution of the respondents in each of the LGAs. It also shows the distribution of the respondents into primary and secondary schools across the LGAs as well as the gender of the respondents. Nine hundred and thirty-eight (51.8%) of the respondents were in Primary Schools, while 874 (48.2%) were from Secondary Schools. The distribution of the respondents concerning their genders across the selected LGAs shows that 781 (43.1%) and 1,031 (56.9%) males and females, respectively were examined. Ifo LGA had the highest number of respondents 247 (13.6%) while Remo North LGA had the lowest with 121 (6.7%) respondents. The highest number of respondents in primary schools was recorded in Ijebu North LGA with 131 (7.2%) and the lowest was in Yewa North LGA with 56 (3.1%) respondents. Abeokuta North LGA had 119 (6.6%) respondents which is the highest in the secondary school category while Remo North LGA had the lowest with 54 (2.9%) respondents. Meanwhile the male and female respondents were both highest in Ifo LGA with 101 (5.6%) and 146 (8.1%) respondents respectively. The lowest number of male respondents was recorded in Yewa North LGA with 53 (2.9%), while the lowest number of female respondents was in Remo North LGA 66 (3.6%) respondents.

Table 1: Distribution of respondents according to LGAs and gender

Local Government Areas	No. of Respondents	%	Primary school	%	Secondary school	%	Males	%	Females	%
Abeokuta North	207	11.4	88	4.9	119	6.6	87	4.8	120	6.6
Ado-Odo/ Ota	201	11.1	105	5.8	96	5.3	86	4.7	115	6.3
Ifo	247	13.6	131	7.2	116	6.4	101	5.6	146	8.1
Ijebu North	232	12.8	143	7.9	89	4.9	95	5.3	137	7.6
Ikenne	194	10.7	91	5.0	103	5.7	83	4.6	111	6.1
Imeko/ Afon	132	7.3	67	3.7	65	3.6	69	3.8	63	3.5
Odeda	158	8.7	85	4.7	73	4.0	70	3.9	88	4.9
Ogun Water Side	197	10.9	105	5.8	92	5.1	82	4.5	115	6.3
Remo North	121	6.7	67	3.7	54	2.9	55	3.0	66	3.6
Yewa North	123	6.8	56	3.1	67	3.7	53	2.9	70	3.9
Total	1812	100.0	938	51.8	874	48.2	781	43.1	1031	56.9

Key: % = Percentage

3.2 Haematuria in respondents in the study area

Among the total 1,812 urine samples tested with dipstick, 92 (5.10%) students were found to be positive for haematuria (Table 2). The highest rates of blood in urine were recorded in Yewa North (28.46%), Ogun Waterside (10.68%) and Imeko Afon (9.85%) LGAs. While the lowest rates were recorded in Abeokuta North (1.93%), Ijebu North (2.16%) and Ado Odo/Ota (2.49%) LGAs, Haematuria was not recorded among respondents from Ikenne, Odeda and Remo North LGAs. The rate of haematuria among the population of respondents in Ogun State was found to be significant ($P<0.05$). This established haematuria as an important symptom of urinary schistosomiasis among the respondents in Ogun state.

Table 2: Haematuria in respondents in the study area in Ogun State

LGAs	Number of respondents	No of males positive (%)	No. of females positive (%)	Total positive (%)
Abeokuta North	207	2 (1.00)	2 (1.00)	4 (1.93)
Ado-Odo/ Ota	201	1 (0.50)	4 (2.00)	5 (2.49)
Ifo	247	6 (2.43)	3 (1.21)	9 (3.64)
Ijebu North	232	3 (1.29)	2 (0.86)	5 (2.16)
Ikenne	194	0 (0.00)	0 (0.00)	0 (0.00)
Imeko/ Afon	132	7 (5.30)	6 (4.55)	13 (9.85)
Odeda	158	0 (0.00)	0 (0.00)	0 (0.00)
Ogun Waterside	197	12 (6.09)	9 (4.57)	21 (10.66)
Remo North	121	0 (0.00)	0 (0.00)	0 (0.00)
Yewa North	123	17 (13.82)	18 (14.63)	35 (28.46)
Total	1812	48 (2.65)	44 (2.43)	92 (5.08)

Key: % = Percentage

3.3 Prevalence of schistosomiasis in the study area

Out of the 1812 urine samples of school children examined across the ten selected LGAs in Ogun State, 455 (25.1%) tested positive for *Schistosoma* ova, with females showing the highest infection rate (12.9%) (Table 3). The results showed that the infection was generally significant in the study area ($P<0.05$). This confirmed the prevalence of urinary schistosomiasis in the study area in Ogun State.

Table 3: Schistosome ova in the urine of respondents in the study area in Ogun State

LGAs	Number of respondents	No of infected males (%)	No. of infected females (%)	Total infected (%)
Abeokuta North	207	21 (10.14)	35 (16.91)	56 (27.05)
Ado-Odo/ Ota	201	19 (9.45)	24 (11.94)	43 (21.40)
Ifo	247	29 (11.74)	39 (15.79)	68 (27.53)
Ijebu North	232	29 (12.50)	32 (13.79)	61 (26.29)
Ikenne	194	0 (0.00)	0 (0.00)	0 (0.00)
Imeko/ Afon	132	36 (27.27)	32 (24.24)	68 (51.52)
Odeda	158	6 (3.80)	4 (2.53)	10 (6.33)
Ogun Water Side	197	39 (19.80)	33 (16.75)	72 (36.55)
Remo North	121	3 (2.48)	1 (0.83)	4 (3.31)
Yewa North	123	39 (31.71)	34 (27.64)	73 (59.35)
Total	1812	221 (12.20)	234 (12.91)	455 (25.11)

3.4 Age distribution of respondents in the study Area in Ogun State

The distribution of infection among the age groups of respondents was shown in Table 4.4. the highest rate of infection was obseerd between the age group 10-12 years followed by12-15 years. Lower infection rates were observed in younger ages as the least was between theag group of 4-6 years.

Table 4: Age distribution of respondents in the study Area in Ogun State

Age groups	Number of respondents	Number infected	% infected
4-6years	251	23	9.16
7-9years	527	89	16.90
10-12years	583	222	38.08
13-15years	451	121	26.83

3.4 Intensity of Schistosomiasis in Ogun State

Table 4 showed that infection intensities were predominantly light (74.1%) across the respondents from all the LGAs studied in Ogun State. The high rate of intensity in Ogun state was highly significant (P<0.01).

Table 4: Intensity of *S. haematobium* infection in the study areas in Ogun State

LGAs	Numbers infected	Low intensity (<50 eggs/10 ml of urine) (%)	High Intensity (≥50 eggs/10 ml of urine) (%)
Abeokuta North	56	52 (93)	4 (7)
Ado-Odo/Ota	43	34 (79.1)	9 (20.9)
Ifo	68	57 (83.9)	11 (16,1)
Ijebu North	61	43 (70.5)	18 (29.5)
Ikenne	0	0 (0)	0 (0)
Imeko/Afon	68	41 (60.3)	27 (39.7)
Odeda	10	8 (80)	2 (20)
Ogun Waterside	72	53 (72.6)	19 (27.4)
Remo North	4	4 (100)	0 (0)
Yewa North	73	45 (61.6)	28 (38.4)
TOTAL	**455**	**337 (74.1)**	**118 (25.9)**

4. Discussion

The significant rate of haematuria among the population of schistosomiasis infected school-children showed that the disease is symptomatic in the Ogun state. The CDC (2018) [6] identified haematuria as a symptom of chronic urinary schistosomiasis. The report of Ekpo *et al.* (2017) [1] showed a high prevalence of 44.5% for haematuria among female children and adults while conducting a pilot survey on Female Genital Schistosomiasis (FGS) in Ogun State. Earlier, Sam Wobo *et al*. (2013) [20] reported a prevalence of 6% for haematuria in the research on the status of urinary schistosomiasis among children in Abeokuta, Ogun State. The 25.1% prevalence recorded in this study showed that schistosomiasis is an endemic disease of major public health concern in Ogun state. However, earlier researchers who had worked in different parts of the State

had reported a higher prevalence among children in Ogun State compared to the findings in this work. The finding of Alabi *et al*. (2018) [21] showed a prevalence of 51.2% in the Yewa area of Ogun State and a higher prevalence among males. Otuneme *et al.* (2014) [22] and Otuneme *et al.* (2019) [23] also reported a higher reported prevalence of 44.1% and 52.75% respectively in a community in Abeokuta North LGA. Adewoga *et al*. (2019) [24] reported prevalence of 48.3% in the study conducted in part of Ogun State. Uthman *et al*. (2018) [25] reported a lesser prevalence rate of 195 in the study conducted in Ifo Local Government area. The report of Ojo *et al.* (2021) [26] showed the high intensity of schistosomiaisis in Ilie and Ore communities of Osun State, Southwest Nigeria. Also, Kabiru, *et al*. (2013) [27] in a community-based survey among school children in Sokoto State showed predominant light intensities among the respondents.

5. Conclusion

Urinary schistosomiasis is still endemic and a major threat among school-age children in Ogun State as it has been established that the disease is significantly prevalent among the population of school-children in the State. The highest prevalence of the disease was observed in Yewa North LGA (59.35%), followed by Ogun Waterside LGA (36.55%). The least prevalence was observed in Remo North LGA (3.31%). Whereas, there was no infection observed in Ikenne LGA. The 25% infection prevalence of urinary schistosomiasis was statistically significant ($p<0.05$) in the study area. The distribution of infection showed the highest prevalence among the female respondents (12.91%). The age group 10-12 years (38.08%) was found to be the most infected, while the age group 4-6 years (9.16%) was found to be the least infected among the age categories of respondents.

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