**Prevalence of Schistosomiasis Amongst Individuals living in Ahoada West Local Government Area, Rivers State, Nigeria**

**ABSTRACT**

Schistosomiasis is a major disease of public health concern. It ranks second to malaria as the most important and devastating parasitic disease, with high morbidity and mortality. It is responsible for approximately 280,000 deaths in sub-Saharan Africa. Schistosomiasis, also known as bilharzia, is a disease caused by parasitic worms. The aim of this study was to carry out a prevalence study of individuals infected with schistosomiasis in Ahoada West Local Government Area, Rivers State. This research was a cross-sectional study. Samples were obtained specifically in Okarki community from Secondary schools, primary health care centres within these areas and others from their residence. A total of seventy (70) human subjects was recruited for this study. Fecal samples were collected and examined microscopically and macroscopically using Kato Katz method. The results showed that Okarki Community of Ahoada West Local Government Area is endemic for Schistosomiasis, with a prevalence of 22% among subjects sampled in the area. In this study, higher prevalence was recorded in males (26%) than females (15%). With regards to risk factors, distance of residence from water source and source of drinking water are relatively associated with the infection. Accurate and timely diagnosis should be reemphasized as a way to curb the disease, effective diagnosis like the kato-katz method is advised. Early treatment is important, thereby preventing the *Schistosoma* infection with drug praziquantel (Biltricide) which often effectively treats schistosomiasis.

### Introduction

Schistosomiasis is a major disease of public health concern. It ranks second to malaria as the most important and devastating parasitic disease, with high morbidity and mortality (7). It is responsible for approximately 280,000 deaths in sub-Saharan Africa, Schistosomiasis is a parasitic disease caused by flukes (trematodes) of the genus *Schistosoma,* after malaria and intestinal helminthiasis, schistosomiasis is the third most devastating tropical disease in the world, being a major source of morbidity and mortality for developing countries in Africa, South America, the Caribbean, the Middle East, and Asia. Schistosomiasis, also known as bilharzia, is a disease caused by parasitic worms, In terms of impact this disease is second only to malaria as the most devastating parasitic disease. Schistosomiasis is considered one of the neglected tropical diseases (NTDs), The parasites that cause schistosomiasis live in certain types of freshwater snails, the infectious form of the parasite, known as cercariae, emerge from the snail into the water (6).

Parasites of the genus Schistosoma *(S. mansoni, S. mekongi, S. intercalatum, S. hematobium*, and *S. japonicum*) cause the disease, the disease in humans is part of the complicated life cycle of the parasites. Humans enter freshwater areas that contain snails that grow Schistosoma sporocysts, that develop into free-swimming cercariae shed by freshwater snails (Biomphalaria and Bulinus genus), considered to be an intermediate host, the cercariae can attach to and penetrate the human skin, migrate to blood vessels, and through lung blood capillaries reach the portal blood or vesicular (bladder) blood systems. during this migration, the cercariae change and develop from schistosomula into male and female adult parasitic worms. The worms incorporate human proteins into their surface structures, so most humans produce little or no immune response to the parasites (9).

Diagnosis requires the detection of eggs in excreta or worm antigens in the serum, and sensitive, rapid, point-of-care tests for populations living in endemic areas are needed (4). The anti-schistosomal drug praziquantel is safe and efficacious against adult worms of all the six *Schistosoma* spp. infecting humans; however, it does not prevent reinfection and the emergence of drug resistance is a concern. Schistosomiasis elimination will require a multifaceted approach, including: treatment; snail control; information, education and communication; improved water, sanitation and hygiene; accurate diagnostics; and surveillance-response systems that are readily tailored to social-ecological settings (5).

The clinical manifestations of schistosomiasis pass by acute, subacute and chronic stages that mirror the immune response to infection, the later includes in succession innate, TH1 and TH2 adaptive stages, with an ultimate establishment of concomitant immunity. Some patients may also develop late complications, or suffer the sequelae of co-infection with other parasites, bacteria or viruses (3). The aim of this researchwas to carry out a prevalence study of individuals infected with schistosomiasis in Ahoada West Local Government Area, Rivers State.

### Study Area

This research was a cross-sectional study carried out within Ahoada West metropolis of Rivers State, a tropical monsoon climate of latitude: 4’59'0"N and longitude: 6’25'43"E, they live in close proximity with their Ijaw relatives. Samples were obtained specifically from Okarki community.

Most of the subjects used for the study were recruited from secondary schools, primary health care centres within these areas and from their residence.

### Study Population

The selected areas were visited and briefed on the purpose of the research and dates fixed for sample collection. A total of seventy (70) human subjects was recruited for this study.

### Determination of Sample Size

The sample size was determined using the method of (4) to calculate the sample size using the equation below:

Using the formula;

Where:

N = Desired sample size

Z = Standard normal deviation corresponding to 95% confidence level set at 1.96

p = The prevalence of population = 7.7% = 0.077

q = 1 – p = 0.923

d = sample error; 5% = 0.05

So,

≈ 70 samples

**Eligibility of Subjects**

**Inclusion criteria for Test subjects**

Individual recruited as subject must be apparently healthy individuals, must be residing in communities in Ahoada West Local Government Area, associated with fresh water fishing or agriculture and must have been working or consuming food materials from river sources for at least 3years and between the ages of 10-50 years.

**Exclusion Criteria for Test Subjects**

The following individuals were excluded as subject for the study; People not residing in Ahoada West communities, individuals currently on medication or avoiding food from water sources.

### Collection of samples

Fecal samples were collected separately in specimen bottles from subjects. The samples were collected in the morning hours at the chosen sampling points. Fecal samples of 20-40grams were collected into a clean sterile container with a tightly fitting lid, stool was not contaminated with urine, water, soil and menstrual blood. Samples were labelled and transported to the laboratory for analysis

### Laboratory Analysis of Samples

**Macroscopic Examination of Fecal Samples**

Stool samples were evaluated macroscopically in terms of color, consistency, quantity, form, odor, and presence of mucus. The presence of a small amount of mucus in stool is normal. However, the presence of copious mucus or bloody mucus is abnormal.

**Microscopic Examination**

**Detection and Quantification of eggs in stool:**

Quantification of the eggs is calculated by collecting 24-hour stool, homogenizing the sample and counting the eggs in a measured sample, stool egg count quantitates the severity of the infection.

**Method ( Kato-Katz technique for helminth eggs )**

Kato-Katz smear are the most commonly used diagnostic tool for detecting and quantifying soil and water transmitted helminth infections in field surveys. Its advantages are field suitability and fast microscopic enumeration of worm eggs.

**RESULTS**

**Prevalence of *Schistosoma* *Mansoni* and other Intestinal Parasites**

Of the total population of 70 persons which participated in this study, 38 were males and 32 females. Males were more predominant with 54.3% and females with 45.7%. In the total population, *Ascaris lumbricoides* was the most prevalent in this group, with 44%, *Schistosoma mansoni* with prevalence of 22%, followed by Hook worm with 16%, *Strongyloidess stercoralis* and *Trichuris trichiura* with 8% prevalence respectively, while EV was the least prevalent with 2%. Details are presented in Table 1.

**Table 1: Prevalence of *Schistosoma Mansoni* and other Intestinal parasites**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **AGE group** | **SEX** | **POPULATION** | **INTENSITY X 24 (EPG)** | | | | | |  |
| **ASC** | **HK** | **SM** | **SS** | **TT** | **EV** |  |
| 0-9 | M | 6 | 5 | 2 | 4 | 1 | 2 | 1 |  |
|  | F | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 10-20 | M | 32 | 26 | 11 | 16 | 4 | 4 | 1 |  |
|  | F | 32 | 21 | 6 | 6 | 4 | 4 | 0 |  |
| Total  %Prevalence |  | 0 | 52  44% | 19  16% | 26  22% | 9  8% | 10  8% | 2  2% |  |

***Schistosoma Mansoni* Survey**

Among age group 0-9, 6 persons were examined and males were more predominant in this age bracket. At intensity 24 (EPG), *Schistosoma mansoni* with prevalence of 27%, among age group 10-20, 32 females were examined. Among the females *Schistosoma mansoni* had a prevalence of 15%, among age group 10-20, 32 males were examined, among these males, *Schistosoma mansoni* had a prevalence of 26%. Details are presented in Table 2.

**Table 2: *Schistosoma Mansoni* Survey**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Age group** | **Sex** | **Population** | **Data** | **Percentage Prevalence (%)** | **Total Parasites** |
| 0-9  10-20 | M  F  M  F | 6  0  32  32 | 4  0  16  6 | 27%  0%  26%  15% | 15  0  62  41 |

**Table 3: Showing T-test for Significance of Male and Female Group**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| **Female** |  |  | **Male** |  |
|  |  |  |  |  |
| **Mean** | **79.64** |  | **Mean** | **126.00** |
| Standard Error | 12.07 |  | Standard Error | 10.78 |
| Median | 72.00 |  | Median | 120.00 |
| Mode | 48.00 |  | Mode | 144.00 |
| Standard Deviation | 56.59 |  | Standard Deviation | 60.96 |
| Sample Variance | 3202.91 |  | Sample Variance | 3716.13 |
| Kurtosis | 1.63 |  | Kurtosis | 2.04 |
| Skewness | 1.33 |  | Skewness | 1.16 |
| Range | 216.00 |  | Range | 288.00 |
| Minimum | 24.00 |  | Minimum | 24.00 |
| Maximum | 240.00 |  | Maximum | 312.00 |
| Sum | 1752.00 |  | Sum | 4032.00 |
| Count | 22.00 |  | Count | 32.00 |

**3.3.1 T-test Two-Sample Assuming Equal Variances for male and female group**

The significant level of Male (Mean = 126.00, Standard Deviation = 60.96, n=32) was

hypothesized to be greater than the level of Female (M = 79.64, SD = 56.59, n = 22).

The difference was significant, *t* (52) = 2.01, *p* = .00 (1 tail). See table below for details.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| ***Female*** |  |  |  | ***Male*** |  |
|  |  |  |  |  |  |
| Mean |  | 79.64 |  | Mean | 126.00 |
| Standard Error |  | 12.07 |  | Standard Error | 10.78 |
| Median |  | 72.00 |  | Median | 120.00 |
| Mode |  | 48.00 |  | Mode | 144.00 |
| Standard Deviation |  | 56.59 |  | Standard Deviation | 60.96 |
| Sample Variance |  | 3202.91 |  | Sample Variance | 3716.13 |
| Kurtosis |  | 1.63 |  | Kurtosis | 2.04 |
| Skewness |  | 1.33 |  | Skewness | 1.16 |
| Range |  | 216.00 |  | Range | 288.00 |
| Minimum |  | 24.00 |  | Minimum | 24.00 |
| Maximum |  | 240.00 |  | Maximum | 312.00 |
| Sum |  | 1752.00 |  | Sum | 4032.00 |
| Count |  | 22.00 |  | Count | 32.00 |

**Table 4 showing T-test Two-Sample Assuming Equal Variances for male and female group**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Table 5 t-Test: Two-Sample Equal Variances** | |  |
|  |  |  |
|  | ***Female*** | ***Male*** |
| Mean | 79.64 | 126.00 |
| Variance | 3202.91 | 3716.13 |
| Observations | 22.00 | 32.00 |
| Pooled Variance | 3508.87 |  |
| Hypothesized Mean Difference | 0.00 |  |
| Df | 52.00 |  |
| t Stat | -2.83 |  |
| P(T<=t) one-tail | 0.00 |  |
| t Critical one-tail | 1.67 |  |
| P(T<=t) two-tail | 0.01 |  |
| t Critical two-tail | 2.01 |  |

**Discussion**

The study has demonsstrated that Okarki Community of Ahoada West Local Government Area is endemic for Schistosomiasis, with a prevalence of 22% among subjects sampled in the area in contrast to a higher prevalence of 51.5% of the disease that was recorded in the upper Nile region of southern sudan (2) and lower prevalence of *S. mansoni* based on Kato Katz technique of <15% recorded among pre-school and school aged children along the shoreline of the Lake Victoria in north-western Tanzania (8). In this study, higher prevalence rates of *S. mansoni* recorded are close to those recorded in other areas in Nigeria, where surveys have been conducted in similar geographical locations…. Prevalence of schistosoma infections observed in the current study area (8.4%) was much lower than that reported in Tanzania (38%) and Western Kenya (42.5%) (4). There was a significant association between settlement that are closest to the pond while other helmets that were farthest from the pond showed no significant association. This outcome could be attributed to the closeness or distance of the community from the ponds and streams, how long these water bodies can support transmission before drying up and the presence and abundance of the snail intermediate hosts in water bodies that serve as transmission tools (9).

In this study, higher prevalence was recorded in males than females, similar to the study carried out in southern sudan where males had a higher prevalence (60%) of *S. mansoni* than females (40%). With regard to risk factors, distance of residence from water source and source of drinking water are relatively associated with the infection (2). This result could be due to the fact that males make more frequent contact with water than females because in traditional African settings, females are mostly associated with indoor activities than males. The males are fond of going to the streams and ponds to swim and bath, thereby becoming more exposed to the snail intermediate hosts in such water bodies.

There was an association between the disease and sex. The significant level of Male (Mean = 126.00, Standard Deviation = 60.96, n=32) was hypothesized to be greater than the level of Female (M = 79.64, SD = 56.59, n = 22 and the association was significant, because the t= 2.02 was greater than the 1.67 for one tail. The difference was statistically significant (P < 0.05). Among age group 0-9, 6 persons were tested and males were more predominant in this age bracket. At intensity 24 (EPG), *Schistosoma mansoni* had a prevalence of 27%, among age group 10-20, 32 females were tested. Among the females *Schistosoma mansoni* had a prevalence of 15%, among age group 10-20, 32 males were tested, among age group 0-9, 6 persons were tested and males were more predominant in this age bracket. At intensity 24 (EPG), *Schistosoma mansoni* had a prevalence of 27%. In age group 10-20, 32 males were examined, Among these male *Schistosoma mansoni* had a prevalence of 26%, among age group 10-20, 32 females were examined and there was a prevalence of 15%, this could be due to the fact that at these ages the children are not greatly exposed to water bodies compared to others and in comparison to the study carried out in Tanzania where prevalence increased from 31.4% among children aged 5–7 years to peak at 61.8% among children aged 11–16 years before declining in the 17–19 year old group (3).

Intestinal parasites other than *S. mansoni* were also recorded among the pupils in the study area. Mixed infections recorded could be due to the ability of parasites to live together in the same host without harming each other. Hookworm infection also causes blood in stool, some of the pupils reported passing blood in stool but no *S. mansoni* seen in their stool. These outcomes could be due to hookworm infection, which also causes blood to be passed in the stool.

Water contact activities of the pupils showed that recreational activities such as swimming and fishing tend to increase the transmission of Schistosomiasis from intermediate hosts to man.

|  |
| --- |
| Intestinal parasites other than *S. mansoni* were also recorded among the pupils in the study area.  Parasites including *Ascaris lumbricoides*, *Hook worm, Strongyloides stercoralis, Trichuris*  *trichiura, Enterobius vermiscularis.* were found in subjects and a one-way Anova showed  significant difference between the six (6) groups of parasites*,* p-value= 0.00 < 0.05 and F  stats = 5.81 > F crit = 2.29. The test is significant. So we accept the alternative hypothesis  proving significant differences between the six parasites observed. |
|  |

**Conclusion and Recommendations**

In conclusion, the study had provided an idea on the prevalence of Schistosomiasis infection among children and adults in Ahoada West Local Government Area. The prevalence of Schistosomiasis among subjects examined showed that Schistosomiasis is a serious public health problem, the prevalence rate is higher in males than in females, Accurate and timely diagnosis should be reemphasized as a way to curb the disease. Effective diagnostic tools like the kato-katz method are advised. Early treatment is important, thereby preventing the *Schistosoma* infection with drug praziquantel (Biltricide) which often effectively treats schistosomiasis.

To reduce the morbidity of Schistosomiasis in these areas, routine medical examination is advised. A community health eradication campaign and adequate health education should be promoted on the control of the disease. The community should be educated on the mode of transmission of the disease and the pathology of the disease and therefore encourage them to adopt control measures. Portable water should be provided in the community with other basic amenities to promote the level of good living in the rural communities, thereby avoiding the use of pond, river and stream water. Lastly, target or selective chemotherapy should be carried out using praziquantel.

**REFERENCES**

1. Anyan, W., Seki, T., Kumagai, T., Obata-Ninomiya, K., Furushima-Shimogawara, R. & Kwansa-Bentum, B. (2013). Basophil depletion down regulates Schistosoma mansoni egg-induced granuloma formation. *Parasitology International*, *62*(6), 508-513.

2 Deganello, R., Cruciani, M., Beltramello, C., Duncan, O., Oyugi, V. & Montresor, A. (2017). *Schistosoma hematobium* and *S. mansoni* among children in Southern Sudan. *Emerging Infectious Disease*, *13*(10), 1504.

3. Fenwick, A. & Webster, J., P. (2016). Schistosomiasis: challenges for control, treatment and drug resistance. *Current Opinion on Infectious Diseases*, 19, 577-582.

4. Handzel, T., Karanja, D. M. S., Addiss, D. G., Hightower, A. W., Rosen, D. H., Colley, D. G., Andove, J., Slutsker, L. & Secor, W. E. (2013). Geographic distribution of schistosomiasis and soil-transmitted helminths in western Kenya: implications for antihelminthic mass treatment. *American Journal of Tropical Medicine & Hygiene*, 69, 318-323.

5. McManus, D., Dunne, D., Sacko, M., Utzinger, J., Vennervald, B. & Zhou, X. (2018). Schistosomiasis. *Nature Reviews Disease Primers*, *4*(1).

6. Mott, K. E., Desjeux, P. & Moncayo, A. (2012). Parasitic diseases and urban development. *Bull World* *Health Organ*isation, 68, 691–698.

7. Nwoke, B. E. B. (2014). The impact of changing human environment and climate change on emerging and re-emerging parasitic diseases. *28th Annual Conference of Nigerian Society for Parasitology*, 23, 310.

8. Odiere, M. R. (2010). High prevalence of schistosomiasis in Mbita and its adjacent islands of Lake Victoria, western Kenya. *Parasitological Vectors*, 5, 278.

9. Sulahian, A., Garin, Y. J., Izri, A., Verret, C., Delaunay, P. & van-Gool, T. (2015). Development and evaluation of a Western blot kit for diagnosis of schistosomiasis. *Clinical Diagnosis Laboratory Immunology*, *12*(4), 48-51.