INDEX OF POTENTIAL CONTAMINATION FOR URINARY SCHISTOSOMIASIS IN AFIKPO NORTH L.G.A. EBONYI STATE, NIGERIA

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ABSTRACT

A study was carried out to investigate and identify population responsible for the potential contamination of Schistosoma haematobium in Afikpo North L.G.A. Ebonyi State, Nigeria. Urine samples of 1,010 subjects living in Afikpo North L.G.A. Ebonyi State, Nigeria were screened in order to determine the prevalence of infection, intensity of infection and index of potential contamination (IPC) for urinary schistosomiasis. Altogether 50 (5.0%) persons were found infected and the intensity of infection among those infected was 48 eggs/10ml of urine. Prevalence in males 33 (5.48%) was higher than in females 17(4.17%). Intensity of infection in males 30 eggs/10ml urine is higher than in female 18 eggs/10ml urine though with no statistical significant. (X² = 0.3123, P>0.05). Both prevalence and intensity of infection were highest in age group 10-14 years for both males and females. There was no significant association in
prevalence between the age group and the sex subjects ($X^2$~ 0.346, p>0.05). Children between the ages of 10-19 years contributed about 69% of the daily egg output into the environment. Consequently, they were responsible for 82% of environmental contamination. The 10-14 years old, which constituted of 44% of infected population, ranked highest among the age group by contributing 56.4% to contamination of environment. Recommended appropriate strategies for control include mass chemotherapy and intensive health education, in order to reduce the high rate of transmission and contamination of environment.

**KEYWORDS:** *Schistosoma haematobium*, schistosomiasis, potential contamination.

**INTRODUCTION**

*Schistosomiasis*, also known as bilharzias, is a disease caused by blood borne fluke (trematode) of the genus *Schistosoma*. It is water borne snail mediated parasitic infection which affects over 200 Million people residing in rural and agricultural areas (WHO, 1998).

Schistosomiasis is the second most prevalent tropical disease in Africa after malaria and is of great public health and socio economic importance in the developing world. It is endemic in 74 countries of the world and Nigeria is among the 44 countries in Africa where the disease is endemic (WHO, 1991).

There are five (5) major species of schistosome causing two (2) forms of Schistosomiasis which are recognized-Urinary Schistosomiasis caused by *Schistosoma haematobium* and Intestinal Schistosomiasis caused by *Schistosoma mansoni*, *Schistosoma japonicum*, *Schistosoma mekongi* and *Schistosoma intercalatum*. *Schistosoma haematobium* (Bilharz, 1852) causes urinary (vesical) schistosomiasis. *Schistosoma japonium* (Fugi, 1847) causes oriental (Asiatic) schistosomiasis.It is restricted to Japan and a few countries in the Far East. Katayama fever occurs more commonly and is more severe following heavy infection by the fluke (Cheesbrough, 1998).

The new species, *Schistosoma mekongi* has been recognized recently to cause endemic Schistosomiasis in Khong Island. The species was shown to cause hepatomegaly and splenomegaly in the inhabitants of the Khong Island (Subash, 1990). Intestinal Schistosomiasis caused by *Schistosoma intercalatum* is confined to Cameroon, Garbon, North-East Zaire and other parts of central and West Africa. The egg of this species was demonstrated in the feaces of a dog, which is the terminal spined eggs (Fisher, 1934).The strains of *Schistosoma intercalatum* are transmitted by *Bulinus africanus* in central and West Africa, while in Cameroun and Garbon another strain is transmitted by *Bulinus forskalii* (Subsash, 1990). Majority of Schistosomiasis are the
Zoonotic diseases involving either man or animal as reservoir hosts. Studies on the enzyme, DNA and chromosomes are the recent advances in the characterization of *Schistoma*, employed to identify the species, for better understanding of epidemiology of the disease. *Schistosoma* differs from the majority of flukes in that there is a male and a female of each species, whereas other flukes like tapeworm are hermaphrodites.

Schistosomiasis is most in rural areas where ponds, rivers streams, ditches and inland lakes form major sources of water for domestic use and where urination and defecation are done indiscriminately and refuse are dumped anywhere. High prevalence in urban areas is found in population associated with fish breeding, irrigation and inadequate sewage system (WHO, 1993), cited by (Cheesbrough, 1998) stated that the development of irrigation scheme and dams for hydroelectric power and flood control have greatly increased the prevalence of schistosomiasis in several countries. Furthermore, the migration of refugees has contributed to an increase in the distribution of the parasite (Cheesbrough, 1998). These planned and unplanned water development schemes have created new breed sites for snails arid in these areas, snails infested canals, rivers and streams are often the most convenient water sources. Extreme poverty, the unawareness of the risks, the inadequacy or total lack of public health facilities plus the unsanitary conditions in which millions of people lead their daily lives especially in the rural areas of developing tropical countries are all factors contributing to the risk of infection (Nmorsi et al., 2007).

**MATERIALS AND METHODS**

**MATERIALS**

Materials used during the research included: Dry screw cap bottles, conical tubes, centrifuge, glass slides, cover slips, cotton wool, binocular microscope (Olympus CH. HNB-107). STUDY AREA.

The study was carried out in Afikpo North L.G.A. of Ebonyi State. The study area falls within latitude 5° 50° and 5° 53° North and longitude 7° 23° and 7° 29° East. The study area is located in the South-Eastern Nigeria. Through random selection five (5) settlements situated near water bodies were selected for the study.

They are Amasiri. Afikpo North L.G.A. of Ebonyi State is a rural area with a climate and vegetation that is consistent with that of typical tropical rainforest region in the Eastern Nigeria. It is an agricultural community. The highest temperature occurring between March and April and the lowest temperature are noticed in the peak of harmattan period (January).
and dry seasons are distinct in the area. Wet season spans from March through May/June to October.

The areas have varied vegetation around the banks of natural water bodies, water logged area. Palm tree predominate the study area while grasses and other economic trees like ‘Achi’ tree occupy the remaining spaces.

The study area is quite muddy (clay) and hilly with stream scattered all over the place. The water bodies that are found in the study area included *fyoogologo* located in Amoha, *Ohio* located in Amasiri, *fyi maegregor* located in Afikpo, *Uke ezogo* located in Ibii and *lyi akpoha*. These streams serve the water needs of the surrounding settlements. However, because of the proximity of these streams to human settlements, more human activities take place in these streams. The streams are used for various purposes like domestic, recreational and occupational purposes. The inhabitants of Afikpo are mainly farmers, practicing both rainy season and dry season farming as well as fishing. About 90% of the populations are Christians. Other occupations of the inhabitants included trading and civil service. The schools included in this study were located near streams such as Ezeke primary school Amasiri, Alaoma primary school Amoha, Community secondary school Amasiri. The transmission of schistosomiasis is by proximity of these streams to human settlements or by way of occupational exposure such as during farming, fishing and other water based activities.

**SAMPLE COLLECTION**

A letter of identification from the Head of department was sought and received. The letter was presented to secretary of education management board, in the Local Government Headquarters where permission was obtained to carry out the project involving collection of urine samples from selected schools in Afikpo North Local Government, Ebonyi state, Nigeria. Ethical permission is obtained from state Ministry of Health. An official letter from the management board was taken to different head teachers and principals of the selected schools who then informed the pupils and students before the urine samples were collected from age range 5-25+ including both males and females.

A number of five (5) schools were visited on different occasions. Data collection was made, by the use of questionnaires. Between 10am and 2pm local time, clean labeled sample bottles were issued to the subjects instructing them to pass their urines into it. The questionnaires were filled by the help of the parents and teachers. The urine samples collected were immediately taken to the
laboratory in the Mater Misericodei hospital Afikpo for analysis. The specimens bottles were returned with the completed questionnaire, the age, sex, occupation of each child's parents were recorded. A total of 1010 samples were collected and analyzed.

SAMPLE ANALYSIS
In the laboratory each urine sample was properly mixed and about 10ml was transferred to a conical tube and centrifuged at 1000 r.p.m. for 5 minutes (Cheesbrough, 1998).

The sediment (after discarding the supernatant) was transferred to a clean dry slide covered with a cover slip and examined entire sediment microscopically using the 10x objective with the condenser iris closed sufficiently to give contrast and 40x objectives for identification of terminal spine eggs of **Schistosoma haematobium** which were counted and recorded. Positive (+) was recorded for specimens containing **Schistosoma haematobium** egg while negative (-) was for the absence of **Schistosoma haematobium** eggs.

STATISTICAL ANALYSIS
The data were entered and analysed using SPSS version. Differences in proportions were tested using Chi square test and bar chart was also used. Positive value of 0.05 or less was considered significant.

RESULTS
Out of the 1010 persons screened for **Schistosoma haematobium** infection 50(5.0%) were found infected. The highest prevalence by school/community was recorded in community secondary school Amasiri, 16(1.58%) persons infected while the least prevalence by school/community was recorded in Model primary school Akpoha, (0.40%). (Table 1)

<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>NUMBER EXAMINED</th>
<th>NUMBER INFECTED</th>
<th>% INFECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>220</td>
<td>12</td>
<td>1.19</td>
</tr>
<tr>
<td>II</td>
<td>200</td>
<td>10</td>
<td>0.99</td>
</tr>
<tr>
<td>III</td>
<td>250</td>
<td>16</td>
<td>1.58</td>
</tr>
<tr>
<td>IV</td>
<td>180</td>
<td>8</td>
<td>0.79</td>
</tr>
<tr>
<td>V</td>
<td>160</td>
<td>4</td>
<td>0.40</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1010</td>
<td>50</td>
<td>5.0</td>
</tr>
</tbody>
</table>
TABLE 2 Sex Age specific prevalence and intensity of Schistosoma hematobim (X2=0.0346 p>0.05) Not Significant.

<table>
<thead>
<tr>
<th>Age</th>
<th>ME</th>
<th>N.I</th>
<th>Prev %</th>
<th>Average Intensity</th>
<th>NE</th>
<th>N.I</th>
<th>Prev %</th>
<th>Average Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>150</td>
<td>7</td>
<td>1.16</td>
<td>8.6</td>
<td>100</td>
<td>4</td>
<td>0.98</td>
<td>5.0</td>
</tr>
<tr>
<td>10-14</td>
<td>212</td>
<td>15</td>
<td>2.49</td>
<td>10.5</td>
<td>150</td>
<td>7</td>
<td>1.72</td>
<td>5.6</td>
</tr>
<tr>
<td>15-19</td>
<td>200</td>
<td>10</td>
<td>1.66</td>
<td>8.9</td>
<td>128</td>
<td>5</td>
<td>1.23</td>
<td>5.4</td>
</tr>
<tr>
<td>20-24</td>
<td>30</td>
<td>1</td>
<td>0.17</td>
<td>2.0</td>
<td>30</td>
<td>1</td>
<td>0.24</td>
<td>2.0</td>
</tr>
<tr>
<td>25+</td>
<td>10</td>
<td>0</td>
<td>0.17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>602</td>
<td>33</td>
<td>5.48</td>
<td>30</td>
<td>408</td>
<td>17</td>
<td>4.17</td>
<td>18</td>
</tr>
</tbody>
</table>

AGE AND SEX RELATED INFECTION

Age and sex related infectious rate show that more males 33(5.48%) than females 17(4.17%) were infected and students in age group 10-14 years in both male and female have the highest prevalence, male 15(2.49%) and female 7(1.72%). The least prevalence by age is recorded in 25+ in both male and female 0(0%). (Table 2). Considering the intensity still on table 2, the intensity of the infection is higher in males (30 eggs/10ml) than in males (18 eggs/10ml). The average intensity/egg count among those infected was 48 eggs/10ml of urine (Table 3). Both prevalence and intensity of infection were highest in age group 10-14 years for both male and females (Table 2).

There was no significant association in prevalence between the age group and sex of students 0.346<9.488, df=4 at p<0.05 Table 2. There is no statistical difference between the intensity in males and females. X 03123.

INDEX POTENTIAL CONTAMINATION (IPC) RESULT

Table 3 gives the index of potential contamination (IPC) among the infected subjects. Infection potential (a measure of the available eggs to contaminate the environment on daily basis)
shows that children between ages 10-19 years were potentially responsible for 69% contamination (Table 3). These same children were actually responsible for 82% of the environmental contamination (Table 3).

When the age structure of infected population was also considered, the relative IPC peaked in the 10-14 years old (56.4%) who constituted about 44% (Table 3) of the total number of infected ones and also bears the heaviest egg burden 16.1 eggs/1 Oml urine (table 3).

**TABLE 4.3: Calculation of Index potential contamination (IPC) among the fifty infected subjects.**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pop str. % (1)</th>
<th>Prev % (2)</th>
<th>Intensity egg /10ml urine (3)</th>
<th>Eggs per day in ml urine of all infected person per 100 pop. 2x3 (4)</th>
<th>Relative contribution (5)</th>
<th>IPC 4x1/100 (6)</th>
<th>Relative IPC% (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>22</td>
<td>4.4</td>
<td>13.6</td>
<td>59.84</td>
<td>25.3</td>
<td>13.2</td>
<td>17.3</td>
</tr>
<tr>
<td>10-14</td>
<td>44</td>
<td>6.08</td>
<td>16.1</td>
<td>97.89</td>
<td>41.4</td>
<td>43.0</td>
<td>56.3</td>
</tr>
<tr>
<td>15-19</td>
<td>30</td>
<td>4.57</td>
<td>14.3</td>
<td>65.35</td>
<td>27.6</td>
<td>19.6</td>
<td>25.7</td>
</tr>
<tr>
<td>20-24</td>
<td>4</td>
<td>3.33</td>
<td>4.0</td>
<td>13.32</td>
<td>5.6</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>25+</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>18.38</td>
<td>48</td>
<td>236.4</td>
<td>100</td>
<td>76.4</td>
<td>100</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The prevalence observed was 50 (5.0%) among 1010 persons examined. The highest prevalence by school was recorded in community secondary school Amasiri with 16(1.58%) infected. This school tagged school iii is located in Amasiri, the village has a nearby stream called Ohia surrounded with economic trees such as 'Achi' and other green vegetations. The peak prevalence in this school and the surrounding community might be due to the increase in human contact to these contaminated bodies. The students whose school is near the streams and ponds normally play in the ponds after school hours. These children also go to these water bodies to plug and pick the 'Achi' for economic purposes. Most of the domestic activities such as washing of clothes and other house hold materials are done in this water bodies because it is the sole source of water to the community. These students are more exposed to being infected by reasons of the proximity to these breeding sites as also observed by (Nmorsi et al., 2007). This buttresses the fact that closeness to breeding sites is an important factor in infection. These water bodies serve the water needs of the area, so there is every tendency of the infection in the area since the parasite
*Schistosoma haematobium* is transmitted by snails that stay around these water bodies i.e. fresh water snails belonging to the genus *Eulinus*. The low prevalence of the infection in the students from Model primary school Akpoha is not surprising because it has an urban status. The school environment is located far from streams.

The prevalence of the disease had been shown to be very high in rural setting and areas surrounded by pond and streams (Eyong, 2008).

Infection rates were generally higher in males than in females probably because of the difference in the pattern of water contact activities, which is generally known to be more frequent in males than in females (Gujral et al., 2000) and this is agreed by observation made by other workers (Ndyomugyenyi.R.2001). This could be traced to the fact that more males are in contact with water bodies through swimming than their female counterparts who may just visit the streams to fetch water. This long contact with breeding sites exposes the males to the snail vectors and increases the chances of their infection. Besides surrounding the streams were some economic trees like 'Achi' which some males go to pick the seeds in its season. This goes along way increasing the infection rate for males than the females (Nduka et al., 1995). The peak intensity recorded in 10 -14 years old however confirmed to the findings of the workers and is attributed to greater water contact activity (Naley et al., 2003). In addition, this age group has low level acquired immunity to this infection (Abebe et al., 2001) or decrease in exposure to infection with advance age (Husting, 1983). This might be because members of this group play outdoors more often and engage in swimming in the stream and pond more than those of the other groups who are either too young or old to carry out such act.

From the index of potential contamination IPC for urinary schistosomiasis , it appears children between 10 and 19 years contributed the bulk of *Schistosoma haematobium* eggs daily excreted into the environment and consequently are potentially responsible for most of the environmental contamination and hence, transmission of the disease in the locality. Similar results have also been reported elsewhere (Ndyomugyenyi et al., 2001).

The 10-14 years old who bear the heaviest egg burden among the age structure and accounted for most of the environment contamination should form the focus of chemotherapy. Treatment of these children will be drastically reduced morbidity and transmission of the disease in this area.
CONCLUSION
This research work has revealed that there is presence of urinary schistosomiasis in Afikpo North L. G.A. Ebonyi state, Nigeria. This disease caused by *Schistosoma heamatobium* is a disease associated with water contact activities. Urine samples collected were screened in order to determine the prevalence of infection, intensity of infection and index potential contamination IPC. There were 50 infected individual among 1010 individual screened shows that the percentage of infection is 5.0. Infection rate is more in males than in females.

Children of school age are mostly affected and contribute mostly to environmental pollution. Investigation has shown that this disease enhance children poor performance in school and absence from school as well. With this, it could constitute to a great source of socio-economic problem if not controlled on time. Treating them therefore will greatly reduce their potential of transmitting the disease as well as improve their growth rates, physical fitness, school performance and general social well being.

Effort to control schistosomiasis should be improved by equipping community health development and other health development and other health organizations to assist people in controlling and educating them in the effect of the disease to humanity. The standard of sanitation should be improved, adequate basic social amenities such as good drinking water, affordable and culturally acceptable means of disposal and treating sewages. This will go a long way to support the use of chemotherapy.

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