PREVALENCE AND INTENSITY OF SCHISTOSOMA HAEMATOBIUM INFECTIONS: A COMMUNITY BASED SURVEY AMONG SCHOOL CHILDREN AND ADULTS IN WAMAKKO TOWN, Sokoto State Nigeria

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Abstract:

Background: Schistosomiasis poses great effects in humans and is still a major public health problem especially during the young age. Objective: To determine Current prevalence and intensity of urinary Schistosomiasis infection among primary school children and adults in Wamakko town, Sokoto state Nigeria. Methodology: A Community based cross sectional epidemiological survey on urinary Schistosomiasis was undertaken between November 2011 and September, 2012. A total of 300 urine samples involving subjects aged between 5 to 30 years and above were collected and analysed for the eggs of Schistosoma haematobium by microscopy using standard filtration techniques. Statistical analysis was performed using SPSS 20 version in which p<0.05 was set as significant. Chi-square test was used to determine significant difference between variables. Relevant data was obtained using simple random sampling and interviewed structured questionnaire to obtained socio-demographic data of the subjects. Results: Of the 300 samples analysed, 115(38.3%) were found to be infected. The mean eggs intensity of infection was 134.0 eggs/10ml urine. The infection was higher among males 110 (43.7%) than the females 5(10.4%), although the difference was statistically significant (p<0.05). A total of three hundred Subjects participated in the study and were screened for urinary Schistosomiasis. The results of the findings shows that gender was among the statistically significant variable p<0.05. Out of 252 males examined, 111 (44.0%) were positive for the intensity of infection and 85(33.7%) had light infection, 19 (7.5%) had moderate while heavy and very heavy infection shows decrease in intensity Only 10.4% of the female gender shows positive for Schistosoma haematobium infection intensity. Conclusion: Finding of this study shows that urinary Schistosomiasis was found to have high intensity and prevalence rate in the area studied and the school aged children and those that engaged in fishing are the most infected and are at higher risk of being infected every day due to their exposure to the infected water. This signifies that Mass Drug Administration should be intensified to halt the infection cycle.

Keywords: Intensity, Schistosoma haematobium, School children,
Introduction

Schistosomiasis as it is well known, refer to a disease caused by trematodes flukes (worms) belonging to the phylum Platyhelminthes. Global estimate indicate that, Some 200 million people are probably infected in 74 countries and an estimated 600 million people are at risk of infection[1]. Urinary and intestinal Schistosomiasis becomes a major public health problem and was rated second to malaria in terms of human infection [1]. Schistosomiasis among school aged children was found to have severe detrimental impact on cognitive, physical and intellectual growth as well as nutritional deficiencies [2]. Schistosomiasis is endemic in Nigeria and its prevalence remains high. Children that is the future leaders of tomorrow bear the greatest burden due to them being the fastest growing vulnerable group in endemic countries and are the important determinant in the development of urinary Schistosomiasis with severe squamous cell Carcinoma of the bladder [1].

Schistosomiasis remains and continues to remain one of the highest prevalent parasitic diseases in the world, if appropriate control and preventive measures are not taken. It has been estimated that annually due to Schistosoma haematobium infection, 70 million, 18 million and, 10 million people suffer from haematuria, bladder wall pathology and hydronephrosis respectively, while another 150,000 people are liable to die from kidney failure [3]. Contact with river water suspected to be contaminated with cercariae is the major risk factor of infection [4]. Several environmental factors influence the Prevalence distribution, intensity of infection, morbidity and mortality of Schistosomiasis [1]. Infection follows contact with water harbouring cercariae which are the infective form of the parasite. Contact patterns with the infested water determine the level of transmission and intensity of infection which can vary between communities Schistosomiasis is sometimes linked particularly to agricultural and water development schemes. Typically, Schistosomiasis is a disease of the poor who lived in condition that favour transmission and lack access to proper care or preventive measures. Many African countries including Nigeria are Schistosomiasis endemic and this poses threat to development, when left untreated due to its disabling effect on young men and women in their productive ages [7,8] .Despite, the high prevalence and the attendant consequences, there is dearth of documented literature on the prevalence and intensity of Schistosoma haematobium infections in the area under study.

At present, the commonest drugs that are widely used in the treatment of this neglected tropical disease are metrifonate, oxamniquine and Praziquentel. The latter is the drug of choice because it is cheap, easily administered, cost effective especially for interventions designed for school children and has a broad spectrum with minimal adverse effect [9]. The combination of these methods with other environmental modifications, biological control and health education has been used with varying degree of success in many African countries including Nigeria. However, despite the reported successes, the incidence and prevalence of the disease have been on the alarming increase worldwide. This has been due to the
Intensity of *S. haematobium*

limitations of the various methods used, which was compounded by the river.

Increasing number of water development projects. These projects are without doubt very important and sometimes necessary. However, they create distortions in flora and fauna resulting in human migration with its attendant risk. At present there is no documented intervention measure in the study area. Therefore there is the need for a detailed study among school children since they are the major contaminants of surface water, have the highest prevalence and intensity of infection and hence the major reservoir of infection [10,11]. This study is therefore aimed to determine the prevalence and intensity of *Schistosoma haematobium* infections among school children and adults in Wamakko town, Nigeria.

Methodology

Study design
A cross sectional study design was conducted among school children and adults in Wamakko town, north-west Nigeria from November, 2011 to December, 2012.

Site and community selection

The study was carried out in Wamakko town Sokoto state, Nigeria. The state lies between latitude 12° ‘N and 13°58N longitudes 04° 8’ E and 6°54E. In 2006, National population census (NPC), Wamakko was estimated to have a population of 179,619 persons [12]. Wamakko attracted large numbers of rural-urban migrants of about 4,536 as at 2010. The study area was characterized by the presence of isolated hills, Sandy savannah, in addition to numerous rivers, streams and dams. The main occupation of the inhabitant in the area are mainly farming and fishing as well as other minor occupations such as trading, laundry services etc. Annual rainfall is about 550mm with highest peak in August. Dry season set in first with the cold harmatan from October to February and a hot period comes in from March to the end of May, when temperature reaches 38°C during the day and humidity less than 20% [13]. However, due to seasonality of rainfall, some do engage in other activities such as trading, laundry services, fishing, as alternative means of livelihood.

Study population and sampling method

The target study population was school children and adults between the age of 5 years to 30 years and above were included in the study and also residents who are present as at the time of sample collections were included in the study. Respondents who fulfil and met our inclusion and exclusion criteria were selected from the population resident in Wamakko. Simple random sampling was used to select children and household to participate in this study.

Inclusion criteria

Patients were eligible to participate in this study if the following criteria are met:

a) Aged from 5 to 30 years and above
b) Diagnosed with urinary Schistosomiasis
c) Has filled up the study questionnaire
d) Parent or legal guardian is willing to sign written informed consent
Exclusion Criteria

i. Patients will be excluded from the study, if the above mentioned criteria are not met:

Sample size estimation

Sample size is calculated based on the previous study done using single proportion formula. Sample size was calculated with confidence interval of 95% and precision of 5%.

\[ N = \frac{(Z^2 \times p(1-p))}{d^2} \]

\( N = \) size of sample
\( Z = \) level of statistical certainty chosen, or confidence interval: 95% => Z = 1.96
\( d = \) degree of accuracy desired 5% so the maximum tolerable error for the prevalence estimate 0.05

Sample selection and analysis

Three hundred 300 urine specimens were collected in a 30ml plastic screw capped container from each adults and school children’s between the hours of 10 am and 14.00 pm and questionnaire administered. On each specimen macroscopy and microscopy were carried out and each specimen was preserved in 10% formalin. The samples specimens were analysed using filtration technique, as described by [14]. The filtration was accomplished by vacuum –pump filtration (Millipore Bedford co-operation. Masachussel, USA). Eggs with terminal spine characteristic of S. haematobium were counted for each positive sample. The wet preparations of the specimens were examined using x10 and x40 objective lens of the Microscope. All the eggs were counted and the intensity of infection was expressed as the number of eggs /10 ml of urine or EPC (Eggs per centilitre=10ml).

Quality control

Reagents and materials used for the analysis were checked using known positive and negative samples before the beginning of sample examination. The urine samples were examined independently by different and experience medical laboratory scientist working at the Usmanu Danfodiyo University, Sokoto Nigeria. All this was done to ensure that a good quality control procedure has been followed.

Data analysis

The statistical package used to analyse the data was SPSS version 20 (IBM, Inc. New york., USA). Chi-square test was used to compare the difference in the distribution of Urinary Schistosomiasis among the different variable study. Data were entered, double check and cleaned to verify entire variable and data analysis were properly documented. Those who did not bring sample or did not participate in the questionnaire survey were excluded in the study. P-value less than 0.05 were considered as significant.

Ethical consideration

The research was approved by the ethics committee of Sokoto State Ministry of health, Nigeria [Ethical approval number [SMH/962 B/Vol.1]. Consent was obtained from adults and parents of the children’s selected for the study, after explaining the purpose and procedures of the research. Children who are unable to understand the purpose and procedures of the study. Written consent was obtained from their parents through their head teachers.

Results

A total of three hundred Subjects participated in the study and were screened
Intensity of *S. haematobium*

for urinary Schistosomiasis. Out of the 300 samples examined, overall 115 (38.3%) were found to be infected with *Schistosoma haematobium*. Table 1, shows the intensity of *Schistosoma haematobium* infection in relation to gender, aged, and Occupation of the participants. The results of the findings shows that gender was among the statistically significant variable \(p<0.05\). Out of the total number of 252 males examined, 111 (44.0%) were positive for the intensity of infection and 85(33.7%) had light infection, 19 (7.5%) had moderate while heavy and very heavy infection shows decrease in intensity as shown in table 1. Only 10.4% of the female gender shows positive for *Schistosoma haematobium* infection intensity.

The age related intensity (mean eggs count/ 10 ml of urine) of the parasite *Schistosoma haematobium* infection in the study area as shown in fig. 1 indicates that the mean eggs count/10ml of urine sample increases with increasing age up to 10-14 years age group and 15-19 years age and begin to decrease there after among the older age group. The highest intensity of infection was found among 10-14 years age group with 39.6 %, followed by 15-19 years age group with 25.3% as shown in fig.1.

The age–education related intensity of *Schistosoma haematobium* infection in Wamakko as presented in fig 2 indicates that out of 123 (40.0%) positive for intensity of infection, 88 (29.3%) had light infection (1-100 eggs/ 10 ml of urine). However, 21 (7.0%) had moderate infection intensity (101-400 eggs/10 ml of urine), and with regards to heavy infection only 9(3.0%) were found (4401-10000eggs/10ml of urine) as shown in fig.2. Presence of eggs in the urine indicates that there was a significant association between intensity of *Schistosomiasis haematobium* infection and presence of eggs in the urine sample.

With regards to education children in primary school shows higher intensity of infection 32.5% when compared to those in secondary or tertiary institution with 3.0% and 2.6% respectively. There was a statistically significance difference in terms of *S.haematobium* intensity and educational level \(p<0.05\) as shown in Fig 2 and Fig. 3 respectively.

![Fig. 1: Age group related intensity with *Schistosoma haematobium* infection in the study area](image1)

![Fig. 2: Age -Education related intensity with *Schistosoma haematobium* infection](image2)
Fig. 3: Education related prevalence with *Schistosoma haematobium* infection in the study area

**Discussion**

The result of the findings on urinary Schistosomiasis among study subjects in North-western Nigeria indicates higher prevalence of Schistosomiasis in the study area. This shows that no adequate attention was given to the disease especially in the northern parts of Nigeria [15, 16]. The overall prevalence of 38.3% observed in the study is lower to that reported in other areas [17] in Cameroon [18] in Mali, and [19] in Southern Sudan. The high rates of prevalence of urinary Schistosomiasis in Wamakko town, Sokoto State reflects high level of Subjects exposure to the infected river and dams. Large number of the Subjects including children in Wamakko harboured low, moderate and very heavy eggs loads which may result in high morbidity that subsequently affects their school performance and intellectual functions.

In the present study, our findings revealed that males were more infected (43.7%) than females (10.4%), perhaps due to more frequent water contact by males in cercariae infested areas around the river (Table 1). This finding is not surprising given the fact that the North western part of Nigeria where the study was conducted has the highest proportion of females, but males are more likely than females to be enrolled in schools in all age group. Generally, this might be related to the deep seated cultural and religious beliefs in the study area that the main role of females is to be house wives and mothers.

Age group 10-14 years recorded highest infection. Males in this age group were observed to be seen swimming in river without exhibiting shyness. It is well known that socio-cultural and religious believed prohibited females of maturity age from bathing in river and dams [20,21 and 22]. However, gender difference in prevalence of urinary Schistosomiasis was not statistically significant P>0.05. This is similar to the report in Southern Nigeria by [23, 24 and 25]. However, significant statistical difference was observed in Zamfara [26] and Kano [27] respectively. The prevalence and intensity of infection with regards to occupation of the respondents showed that fishermen had a high prevalence rate 66.0%, followed by farmers with an infection rate of 39.6% (Table 1). The role of occupation in fishing and farming in the epidemiology of urinary and intestinal Schistosomiasis is well known. Hence, since some part of the study was carried out around riverine and dam sites area, the children are more likely to accompany as well as assist their parents on the farms and in the process may seized opportunity to swim and bath in canals or river at the end of a day’s work. This will caused in their exposure rates to increased and are therefore likely to be infected.
Table 1: Intensity of Schistosoma haematobium infection in relation to sex, age and occupation of the participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intensity of S. haematobium (%)</th>
<th>Total examined</th>
<th>X²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No infection</td>
<td>Light 1-100</td>
<td>Moderate 101-400</td>
<td>Heavy 401-1000</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>43[89.6]</td>
<td>3[6.2]</td>
<td>2[4.2]</td>
<td>0[0.0]</td>
</tr>
<tr>
<td>Male</td>
<td>14[56.0]</td>
<td>85[33.7]</td>
<td>19[7.5]</td>
<td>5[2.0]</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-19</td>
<td>53[69.7]</td>
<td>18[23.7]</td>
<td>5[6.6]</td>
<td>0[0.0]</td>
</tr>
<tr>
<td>20-24</td>
<td>16[76.2]</td>
<td>5[23.8]</td>
<td>0[0.0]</td>
<td>0[0.0]</td>
</tr>
<tr>
<td>25-29</td>
<td>3[75.0]</td>
<td>1[25.0]</td>
<td>0[0.0]</td>
<td>0[0.0]</td>
</tr>
<tr>
<td>30+</td>
<td>23[79.3]</td>
<td>3[10.3]</td>
<td>3[10.3]</td>
<td>5[1.7]</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>21[11.4]</td>
<td>1[1.1]</td>
<td>1[1.8]</td>
<td>0[0.0]</td>
</tr>
<tr>
<td>Farming</td>
<td>110[59.8]</td>
<td>62[70.5]</td>
<td>7[33.3]</td>
<td>3[60.0]</td>
</tr>
<tr>
<td>Laundry</td>
<td>12[6.5]</td>
<td>3[3.4]</td>
<td>2[9.5]</td>
<td>0[0.0]</td>
</tr>
<tr>
<td>Irrigation</td>
<td>25[13.6]</td>
<td>3[3.4]</td>
<td>0[0.0]</td>
<td>0[0.0]</td>
</tr>
</tbody>
</table>

Conclusion
In conclusion, it has been shown that Schistosomiasis prevalence and intensity is high and that, the health education proved to be effective in terms of improving the level of education, thereby causing an attitudinal change of the school children and adults fishermen towards Urinary Schistosomiasis which will ultimately cause a change in behavior that not only promote health but also prevent diseases.

Recommendation
It was recommended that reducing morbidity by mass chemotherapy of all school children living around the dam as recommended by WHO is necessary, when school specific prevalence is high will reduce the disease burden [28]. Secondly, community mobilization may arouse their awareness about the disease. Provision of an affordable, acceptable and easy to maintain potable water and sanitary facilities in schools, so as to reduce exposure to contaminated surface water. This should involve the use of community association such as Parents Teachers Association in schools, Farmers co-operative Society in villages, traditional, religious and political leaders in both urban and rural areas, so as to reduce the menace of this debilitating disease.
Competing interest

Authors declare that they have no competing interest.

Author’s contributions

KM has participated in the conception and design of the study, data collection, analysis and interpretation. He also contributes in the manuscript writing. MRA has participated in the study design, reviewing of the final version of the manuscript. He also provides effective supervision and co-ordination of the research. Impact he is all round in advising how to go about samples collection and other clinical responsibility for the whole research. Ikeh E. I has immensely contributed in on-site execution, data analysis and interpretation. He also supervised and co-ordinated the field data analysis in Nigeria. A I participated in the conception and design of the study as well as in supervision. JO Contributed in the manuscript writing and reviewing as well as in keeping samples after transportation. All the authors read and approved the final manuscript. Fabiyi JP has contributed in Supervision of field data collection and analysis as well as in study design in Nigeria.

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