

The Current Status of *Schistosoma Mansoni* among *Biomphalaria* Snails in Kabaka's Lake, Kampala Uganda

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Abstract: The research was carried out to determine the current status *Schistosoma mansoni* among *Biomphalaria* snails in Kabaka's lake in Uganda. The study area was divided in to 12 sites and selection of the sites was purposive only targeting the potential breeding habitats for snails. The research used both hand picking and scoop net to collect snail samples. All sample sites had an equal measurement of 10 sq meters. *Biomphalaria* snails collected from each sample site were examined by cercarial shedding method. Screening result indicated that 17.9% of *Biomphalaria* snails collected in this study were infected with *Schistosoma mansoni* in the lake. The continued existing of these snail species is a proxy for disease (*Schistosoma mansoni*). Therefore, this pose a public health threat to the community surround the lake and more especially those that are having direct contact with water in the lake. Intensive health education campaigns should be embark on to educate the populace on the health implication of Schistosomiasis so that the general public will take proper precaution by treating water before use and improve sanitary condition of their environment to avoid further spread of the diseases and reduce the chance of snails being infected.

Key words: Kabaka's lake, *Schistosoma mansoni*, *Biomphalaria* Snails, Schistosomiasis

I. Introduction

Schistosomiasis is one of the prevalent parasitic diseases in the world, second to malaria (WHO, 2005). It affects 207 million of the world poorest people through 74 countries in several parts of the world (King, 2009). About 85% of them live in Sub-Saharan Africa (Chitsulo *et al.*, 2004). There are five main *Schistosoma* species that affect humans which are: *S. haematobium*, *S. mansoni*, *S. japonicum*, *S. mekongi*, and *S. intercalatum* (Chitsulo *et al.*, 2004). Schistosomiasis mostly affects poor rural communities with limited access to basic sanitation and clean water (Gazzinelli *et al.*, 1998). Although Schistosomiasis related mortality is low compared with mortality caused by Human Immunodeficiency Virus (HIV) and malaria, morbidity is high and more often underreported (Samuel *et al.*, 2012). Infections with schistosomes results in two main forms of the disease, namely urinary Schistosomiasis caused by *Schistosoma haematobium* and intestinal Schistosomiasis caused by *S. mansoni* which is responsible for bloody diarrhea and hepatosplenomegaly that affects 4.4 and 8.5 million people in the world respectively (Van der werf *et al.*, 2003). In Africa, Schistosomiasis is caused predominantly by infection with *Schistosoma mansoni*, which cause urinary and intestinal Schistosomiasis respectively (Van der werf *et al.*, 2003). It is mostly prevalent in Sub Saharan Africa, where not only it overlaps with often few low priority diseases but also high priority disease such as HIV, malaria and tuberculosis (Hotez and Aruna, 2009). Furthermore, almost 300,000 people die annually from Schistosomiasis in Africa (Kjetland *et al.*, 2000).

With many lakes, rivers, dams and ponds, Uganda has a diverse freshwater environment that offers numerous habitats for aquatic snails. In particular, the Great East Africa lakes of Victoria and Albert provide particularly conducive habitats for *Biomphalaria*, the intermediate snail host of *S. mansoni*, which through poor local sanitation and water hygiene, subsequently also become conducive sites for transmission of intestinal Schistosomiasis. In Lake Victoria, *Biomphalaria choanomphala* and *Biomphalaria sudanica* have been recorded (Prentice, 1972; Brown, 1994) while in Lake Albert, *Biomphalaria stanley* and *Biomphalaria sudanica* are found (Brown, 1994). While the earlier contributions of (Cridland, 1955; Prentice, 1972) provided key information concerning the compatibility of these species with *S. mansoni*, the ecology of these snails, their population dynamics and parasitic transmission patterns in situ have not yet been to be adequately studied.

In Uganda and in particular Kampala, lakes are major sources of water available for domestic usage. Previous studies have indicated that there was an incidence of Schistosomiasis in Kabaka's lake (Makanga, 1975). Kabaka's lake is one of the prominent sources of water to both individuals and animals in the city center of Kampala. There is need to safeguard the health of people using water from the lake. Studies had shown that Schistosomiasis is a silent killer, thus the need arise to investigate the safety of this water by determining the presence of Schistosomiasis in the lake. Therefore the aim of the study was to determine the current status of *Schistosoma mansoni* in Kabaka's lake.

II. Material And Method

Study Area

The study was conducted along the shores of Kabaka's lake. Generally, the study area was divided into twelve sites. The selection of the sites was purposive only targeting the potential breeding habitats for snails and in which anthropogenic activities were frequent along the shores of the lake.



Plate 1: Map of Kabaka's lake showing sample sites.

Sampling procedure

Snail sampling was conducted at weekly intervals (One day in a week) starting from December, 2014 to February, 2015 at 12 selected sample sites. The sampling usually started from 7:00am-10:00am in the lake. *Biomphalaria* snails were collected from the macrophytes along the shores of the lake. The study used both hand picking and scoop net. A scoop net consisted of a metal ring of 36 cm length and 30 cm diameter attached to a wire net of 16 meshes per inch. The metal ring can easily be connected to a metal handle comprising of sectional pipes, each 35 cm long which can be joined to each other by a screw to give a total length of 2.45 meters (Urquhart *et al.*, 2001). All 12 selected sites had equal rectangular size measured 10 m along the shores of the lake. The corners of the rectangular sampling sites were marked by pegs so that successive sampling could be performed. Each site was searched for a period of 15 minutes starting from sample site A up to the sample site L once in a week for the periods of 12 weeks. All snails found floating or attached to vegetation in the selected sample sites were collected and placed on white Polythene bags according to the sites code. Polythene bags were allocated to each sample site containing their names.

Sample Treatment

After the samples were collected from the field, they were then cleaned, dried and placed into polythene bags marked with the relevant site codes and then brought to the laboratory at Kampala International University. *Biomphalaria* snails collected from each sample site were examined by cercarial shedding method. The protocol used here was same as established by Webbe and Struck (1964). Each snail was placed separately into a (5 ml) glass beaker filled with dechlorinated tap water. The glass beakers were then exposed to 30 minutes period of natural bright sun light to induce shedding of cercariae. Each snail was carefully observed after being placed in natural light, the total number of infected snails that shed cercariae was recorded according to the site code and those that did not shed cercariae were also recorded as not infected snails. The screening of snails was conducted separately starting from sample site A to sample site L.

III. Data Analysis

Statistical Package for social sciences (SPSS) was used. The data collected passed through the following processes: data editing, data coding, data entry and analysis. Frequency and percentage was to analyze the percentage of infected snails with *Schistosoma mansoni* in Kabaka's lake.

IV. Result And Discussion

The result from Table: 1 indicated that *Biomphalaria* snails from sample site K had the highest number of infected snails that shed *Schistosoma mansoni* cercariae with 25%, followed by sample site L and H with 23.5% and 19.5% respectively. Upon all selected sample sites, site I was the only sample site with the lowest record of infected *Biomphalaria* snails with 15.8%. The overall percentage infected *Biomphalaria* snails that

shed cercariae from all sample sites was 17.9%. The remaining 82.1% did not shed cercariae and recorded as uninfected snails from the lake. Based on these findings, it reveals that sample sites with high number of snail collections were the sites that have high number of recorded infected snails with *Schistosoma mansoni*. The higher the number of snails determines the high number of infected snails with *Schistosoma mansoni* in Kabaka's lake. Also, these findings reveal that *Schistosoma mansoni* is present in Kabaka's lake and community surround the lake are in risk of this disease more especially individuals that are having direct or indirect contact with the water from the lake.

Table 1: Result of screening of *Biomphalaria* snails for *Schistosoma mansoni* infection in Kabaka's lake

Sites	Locations (gps coordinates)	Infected snails (shed cerceriae)		Un infected snails (cerceriae not shed)		Total number of snails
		frequency	percentage	Frequency	percentage	
Site A	0°17'47.26"N 32°33'47.10"E	5	16.1	26	83.9	31
Site B	0°17'44.37"N 32°33'39.30"E	6	15.8	32	84.2	38
Site C	0°17'45.55"N 32°33'36.73"E	6	16.7	30	83.3	36
Site D	0°17'47.70"N 32°33'37.78"E	4	14.3	24	85.7	28
Site E	0°17'50.61"N 32°33'39.24"E	4	13.8	25	86.2	29
Site F	0°17'53.14"N 32°33'39.98"E	6	17.1	29	82.9	35
Site G	0°17'56.99"N 32°33'39.76"E	6	15.8	32	84.2	38
Site H	0°17'58.06"N 32°33'40.90"E	8	19.5	33	80.5	41
Site I	0°17'58.45"N 32°33'43.13"E	3	15.8	16	84.2	19
Site J	0°17'55.99"N 32°33'44.59"E	7	18.9	30	81.1	37
Site K	0°17'53.69"N 32°33'45.35"E	9	25.0	27	75.0	36
Site L	0°17'51.06"N 32°33'44.79"E	8	23.5	26	76.5	34
TOTAL		72	17.9%	330	82.1%	402

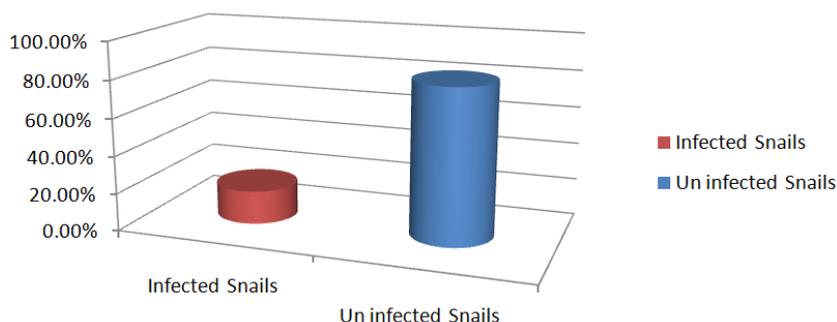


Figure 1: Infected and uninfected *biomphalaria* snail from kabaka's lake.

The results in Figure 1 above illustrate the percentage infected *Biomphalaria* snails with *Schistosoma mansoni* from Kabaka's lake. The results reveal that 330 screened *Biomphalaria* snails were not infected and did not shed *Schistosoma mansoni* cerceriae with (82.1%). On the other hand 72 screened *Biomphalaria* snails were infected and shed *Schistosoma mansoni* cerceriae with (17.9%). This implies that *Schistosoma mansoni* is present in the lake.

V. Discussion

The study under taken confirms that *Schistosoma mansoni* is present in Kabaka's lake. The screening of *Biomphalaria* snails from 12 different sites of the lake have shown that 17.9% of the *Biomphalaria* snails were naturally infected with *Schistosoma mansoni* that shed cerceriae. From the findings it was found out that *Schistosoma mansoni* was present at all selected sample sites in the lake. The occurrence of *Schistosoma mansoni* varies from one site to another. Result of this findings reveal that sample site with high number of snails collection had the highest number of infected snails that shed *Schistosoma mansoni* cerceriae in Kabaka's lake. The overall percentage of infected snails in the lake was 17.9% out of 100%. The remaining percentage

82.1% considered as uninfected snails. This current findings show that Kabaka's lake with 17.9% of infected *Biomphalaria* snails is regarded as the potential reservoir of *Bilharzia*. The finding of the study was agreed with Arijo *et al.*, (1999) who reported that Schistosomiasis is present in Pakistan. The screening of *Biomphalaria spp* snails from 14 different areas of Tando Allahyar, district Hyderabad have shown that as much as 2.31% of the snails were naturally infected with schistosome infection. As far as the presence of Schistosome infection is concerned, the findings of present study also are in agreement with those of Arijo *et al.*, (1999) who screened snails from Tandojam and its adjoining areas and reported 7% snails naturally infected with Schistosomes. Similarly, these results were in line with Kariuki *et al.*, (2004) in Msambweni, *Biomphalaria* snails shed *Schistosoma mansoni* cercariae 18.8% within the pond. My findings disagree with Nagi *et al.*, (1999) who studied *Biomphalaria* snails in Yemen and observed higher infection rate of snails shedding cercaria, 54 snails shedding *Schistosoma mansoni* cercariae from a total of 55 snails (98.2%).

VI. Conclusion

In conclusion, results from this study indicated that *Schistosoma mansoni* intermediate hosts (*Biomphalaria snail*) are still present within the lake and the continued presence of these snail species is a proxy for disease (*Schistosoma mansoni*). Also the screening result revealed that a great number of *Biomphalaria* snails in the lake were infected with *Schistosoma mansoni*. Therefore, this pose a public health threat to the community surround the lake and more especially those that are having direct contact with water in the lake.

VII. Recommendations

Basing on the study findings, the researcher makes the following recommendations: the general public should be inform about the present condition of the lake and they should treat the water before using it for domestic purposes Parent should stopping children from swimming in the lake so as to protect them from Schistosomiasis risk since Kabaka's lake is contaminated with *Schistosoma mansoni*. Intensive health education is vital, but large- scale health education campaigns will serve no purpose if alternatives to current water contact practices are not available. Thus, efforts must continue to persuade donors, as well as national agencies, to increase the quantity of safe water supplies in areas endemic for Schistosomiasis. Improved sanitation, defecation or urination in or near open waters should be avoided so that snails have less chance of becoming infected.

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