# Epidemiology, of bilharzias (schistosomiasis) in Uganda from 1902 until 2005

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**Abstract**

**Background:** *Schistosoma mansoni* was observed and reported in Kuluva hospital Arua District in north western Uganda as early as 1902. *S. mansoni* is widely distributed in Uganda along permanent water bodies.

**Objective:** To review the litreture on scistosomiasis in Uganda, since 1902.

**Method:** The core literature for this short review was searched from reports and publications by the British colonial Ministry of Health Districts Medical officers and Entomologists. Additional information was obtained from Makerere University Medical School library archives, London School of Hygiene and Tropical Medicine library archives, University of Antrwap, and post independence publications on schistosomiasis in Uganda in various journals.

**Results:** Since it was first detected in 1902 *Schistosoma* (S) *mansoni* is more widely distributed in Uganda than *S. haematobium*. However *Schistosoma mansoni* and *S. haematobium* are of public health importance in Uganda and the importance of migrants and fishermen in disseminating infections into non-infested areas and intensifying infection in areas already infested have been reported.

**Conclusion:** *S. mansoni* has been on the increase in Uganda whereas *S. haematobium* is localized in sporadic foci in the north of Uganda. Treatment with praziquantel the drug of choice in Uganda used in schistosomiasis control programme has reduced development of severe schistosomiasis.

*African Health Sciences* 2008; 8(4):239-243

## Introduction

The ancient Egyptians recorded comprehensive clinical accounts of bilharziasis as laid down in the papyrus Pfister[1]. Ebers and Hearst Ruffer proved the presence of *Schistosoma* ova in mummies and Canopic jar of mummified viscera[2]. The first published record of the causative agent was after the post-mortem discovery of the worm in the mesenteric veins of a patient in Kasr el Aini Hospital in Cairo by Theodor Bilharz[3]. The first published account of the taxonomy of the genus Bilharzia was by Meckel Von Hemsbach two years after Weinland named the genus *Schistosoma* (Meckel Von Hemsbach 1856, Weinland 1858)[4, 5]. Three species of Schistosoma are known to be parasitic to man. *Schistosoma (S.) haematobium*, (Bilharz 1852)[3] while Brumpt named *Schistosoma (S.) mansoni* in 1931 (Brumpt 1931)[6]. Cort in 1919 was the first to identify cercariae of the Japanese blood flukes, *Schistosoma japonicum* in Katsurada (Cort 1919)[7]. Bhalerrao in 1934 observed the occurrence of *Schistosoma japonicum* in Katsurada in India (Bhalerrao 1934)[8]. *Schistosoma mansoni* and *S. haematobium* occur in Uganda. Besides these two schistosomes, *S. intercalatum* has been reported in 10 countries mainly in central and West Africa, but also in Northern Uganda[9].

This short review will cover some of the foundamental work on schistosomiasis in Uganda from 1902 and show steps taken after, by the Uganda Ministry of Health to control the transmission and morbidity of schistosomiasis in Uganda.

## Schistosome infections in Uganda.

*Schistosoma mansoni* was first observed and reported in Kuluva hospital Arua District north western Uganda by Aldo Castallani and G.C Low in 1902 in a hospitalised patient with sleeping sickness[10]. McConnely 1923, Rawson & Gopal 1924 noted a high incidence of *S. mansoni* in the West Nile[11, 12].

Nelson was the first to make a complete assessment of the prevalence, distribution and importance of schistosomiasis as a health problem in Uganda, especially in West Nile[13]. He found that the prevalence and intensity of infection was highest immediately along the banks of the River Nile and decreased with altitude and distance from the Nile. Schwetz also made a similar observation that altitude

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and distance influence the distribution of Bilharzia in Lake Bunyonyi in Kabale in Western Uganda[14].

Nelson further observed that enlarged spleens and anaemia were a common clinical feature among children around ten years old with high intensity of infection. In a broader perspective, Webbe and Jordan advanced the knowledge of schistosomiasis in East Africa, which included Uganda, Kenya and Tanzania[15]. In the seventies, studies by Ongom documented the epidemiology and consequence of S. *mansoni* infection among Jonam in a fishing village of Panyagoro and Panyimur in West Nile[15, 16].

In Lango district, now Lira district, Schwetz reported vesical Bilharzia in the community living in Aloi, Ayer along River Okole and other tributaries of River Acwa[17]. Heamaturia was common among both adults and children in this community. Rosanelli reported cases of *S. haematobium* in Pader district, formerly (East Acholi district) along River Odek, a tributary of River Acwa. These areas are all neighbouring Lira district where *S. haematobium* is present according to Rosanelli[17.] Many studies in Northern Uganda were in the former West Nile district where *S. mansoni* infection is hyperendemic [12, 18]. Bradley investigated the role of fishermen in disseminating *S. mansoni* in Lolui Island in Lake Victoria as an important epidemiological aspect[19]. Prentice studied the epidemiology of *S. mansoni* among Caucasian immigrants and indigenous Ugandans living near the shore of Lake Victoria and Entebbe [20.] In 1961, Barnley and Prentice showed a prevalence of *S. mansoni* to be (14%) in immigrants living in Kampala and Entebbe with definite history of swimming in Lake Victoria [20, 21, 22].

The Public Health importance of migrants from schistosomiasis endemic areas of Uganda in disseminating infections into non-infested areas and intensifying infection in areas already infested has been reported [19, 23]. In most parts of Uganda, schistosomiasis was thought to be an occupational disease mainly of the rural poor communities. Nevertheless, recent studies indicate that urban schistosomiasis is emerging in water bodies within vicinities of some townships in Uganda [24, 25]. The fishing village of Kigungu in Entebbe is one of such water bodies. Many people have been acquiring schistosomiasis without knowing the source of their infections. These have resulted in unexpected increase in the incidence of *S. mansoni* observed in Entebbe and Kampala hospitals. However, it was established that the sources of major transmission foci were along the canoes landing sites in Entebbe and streams within Kampala [23, 25, 26].

The snails vectors which transmit the parasites were detected as early as 1950 by Prentice (a Senior Entomologist - Ministry of Health Uganda based in Wandegeya Vector Control Division) [20, 21, 22]. The snails found were the *Bulinus spp* which transmit urinary Bilharziasis (*Schistosoma heaemotobium* and the *Biomphalaria spp* which transmit intestinal Bilhaziasis (*Schistosoma mansoni)* [27]. The susceptibility of these snails *(Biomphalaria spp)* to *Schistosoma mansoni* were tested by Prentice 1950 in Wandegeya and repeated by Odongo-Aginya 1987 in Uganda Virus Research Institute Entebbe [25, 27]. *Schistosoma haemotobium* does not occur in Entebbe despite the fact that the snail intermediate host for the parasite, the *Bulinus spp*, do exist in most parts of the shore line in Entebbe [25, 26, 27].

**The upsurge of *Schistosoma mansoni* in Entebbe**

*Schistosoma mansoni* is the only species of Schistosome occurring in the fishing villages and recreational sites in Entebbe [24,25,26,27]. Berrie, using faecal direct smear method in Entebbe Hospital found 6.5% of Katabi villagers with *Schistosoma mansoni* infections and 1.4% infection in Nakiwogo[28]. In 1963, Bradley showed 14% (12 out of 86) of *Schistosoma mansoni*in immigrant population living in Entebbe[29]. Those infected had a history of sailing and swimming at the present Sailing Club. Billinghurst reviewed hospital records at Mulago between 1955-1964 and found that 55 non-African had *Schistosoma mansoni* and over half of those admitted having swum in the Lake at Entebbe[30]. In the same year, a survey conducted in Primary Schools in Entebbe among African and Asian pupils showed that 8% infected children acquired the infection from Lake Victoria in Entebbe while in Bugonga fishing village 28 out of 190 (15%) were found infected with *Schistosoma mansoni*. These infections were higher among fishermen 17%. In 1969 a total of 66 people wore studied at Kigungu and 13 (20%) were infected of which the majority were children 10 out of 13(77%) [30].

Recent studies of Bilharziasis in Entebbe and Kigungu indicated an up surge of the disease in all fishing villages around Entebbe [20, 22, 23, 25].In 1982 Kinoti of Nairobi University Department of Parasitology at the request of United Nation Development Programme (UNDP) and Uganda Ministry of Health made assessment of schistosorniasis in the entire Uganda [22]. In Entebbe, at Kigungu, Kinoti studied 64 people and out of these 26 (40.6%) were infected. The study by Kinoti was one of the first after the colonial rule in Uganda and it revealed that bilharziasis is a much greater health problem

in Entebbe fishing villages than it was previously believed [22]. Bukenya studied 336 people in Kigungu village. In this study 42 people out of 335(12.5%) were found to be infected. The majority of the people studied were between 30 and 40 years old [23].

In 1987 Odongo-Aginya and Mugish studied 358 migrants from Schistosorniasis mansoni endemic areas of Uganda living in Entebbe. High infection of 144 out of 358 (56.2%) were found among people from schisiosomiasis endemic areas of West Nile region living in various places along the fishing villages in Entebbe. This is one of the best ways of disseminating infections of bilharziasis to other area. A survey was conducted for the snail intermediate hosts and their susceptibility to the local strain of *S. Mansoni*, were tested [25].

In 1990 Lakwo and Odongo-Aginya compared the prevalence of *S.mansoni* among 520 people that is 260 people from each village of Nakiwogo and Kigungu in Entebbe. They found that in both villages infections were high, with Nakiwogo having 95(36.5%) while at Kigungu 40 (15.4%) people were infected. The lower figure of infection in Kigungu was due to difference in the age group studied, older fisher men were studied in Kigungu[20]. This might also explain why Bukenya and Abongomera (1985) recorded a lower infection rate at Kigungu. Their study was based on older people between 30-40 years old [23]

**Distribution of *Schistosoma mansoni* in Uganda**

It is clear that schistosomiasis mansoni has been building up in Entebbe and it is already a health problem in this area[20, 22, 23, 25]. It is apparent that a similar upsurge of Bilharziasis is going on in other part of Uganda [31]. Recently described foci of schistosomiasis in Uganda are characterised by increasing prevalence and intensity of infection. New foci have been described in the northern part of Uganda along the non-seasonal large bodies of water with suitable ecological habitats for the gastropod hosts of schistosomes [24, 31]. More recently Kabatereine showed that *S. mansoni* was prevalent in 38 districts of Uganda and *S. haematobium* occurred in just two districts of the 38 districts. Presently, it is estimated that about four million Ugandans have bilharziasis and 17 million are at risk of getting the disease[31].

**Human water contact patterns in Uganda**

Human water contact activities in Uganda have been described mainly as recreational, domestic and economic [11, 14, 20]. In the dry season the level of many water bodies are reduced and the fast flow of the meandering rivers and streams slacken occasionally forming small pools. This contributes significantly towards disease transmission [14, 24]. The human water contact during the dry seasons is especially high. The transmission situation is aggravated by refugee movement in Northern Uganda. However recent epidemiological figures from the Northern part of the country are lacking because of the insurgency which has impeded field survey for over two decades.

**Preparation for bilharzia control**

A detailed plan of action was developed by health and education officers from the original 18 selected districts. Advocacy at lower levels was achieved through workshops for district civic and political leaders, where programme objectives, implementation strategy and the required support were comprehensively discussed [31].

**Management of schistosomiasis in Uganda**

Uganda National Bilharzia Control Programme (UNBCP) was instituted to reduce the worm load in the school age children and the community at risk of infection with bilharzia by annual mass praziquantel (PZQ) chemotherapy[31]. Target groups are identified by stool examination and PZQ administered to them according to the WHO guide line**.** In schools treatment is carried out by teachers and in communities by Community Drug Distributors, who are selected by the concerned communities and trained by the district trainers[31]. The training curriculum includes treatment procedures, record keeping, action in case of unforeseen side effects, and drug accountability. Their participation is voluntary and unpaid.

**Health education in Uganda**

Public health education on schistosomiasis is of paramount importance. This holds especially true for the village level. Health committees and public talks, group focus discussions and other methods of health education have been practised in Uganda and their results have been published [7, 11,14,25,31]. As of late public radio calls have supplemented the panel of methods. The people were made aware of the disease and its transmission by water contact activities. Special emphasis was put on the health education of the primary school children whose school is situated near water bodies. In addition they were advised to avoid bathing at the lake [25, 31.]

**Sanitation**. The establishment of pit latrines in all of the homes of the country is encouraged and is under way [25].

**Environmental control**. Papyrus clearing of water sites in swamps and bush clearing by mobilized inhabitants is a cost effective way of reducing the risk of disease transmission. The bush clearing along the lake has two positive effects. Firstly, the snail population is distinctly reduced. A lower number of snails mean a lower number of cercariae and therefore a diminished risk of infection. Secondly, it caused a change in the people's behaviour and reduced the faecal contamination of the shore [25].

The (UNBCP) is implemented by Vector Control Department in Wandegeya and assisted in the districts, by Director of Medical Services, the district vector control officers and district health educators in the Ministry of Health [31].

## Monitoring and evaluation

Monitoring and evaluation procedures were designed to assess different aspects of the programme, such as impact on health, coverage of the treatment campaign and success and challenges in implementation. The monitoring and evaluation began in 2003 with the collection of baseline data from a cohort of 4351 children and 1088 adults from 37 schools and nine communities [32, 33]. Stool samples, and questionnaires were used to measure reductions in prevalence, intensity and morbidity resulting from disease and were collected on an annual basis. Anthropometric measurements of the school-aged children, (e.g. height and weight) were also collected, as were finger-prick blood samples to assess their anaemia status through the measurement of haemoglobin levels [31].

Process monitoring and evaluation was carried out to assess awareness, perceptions and adherence to the implementation guidelines of the programme. Questionnaires were administered through independent external evaluators to all stakeholders involved in the activities of the programme. Programme costs, both in the district and overall in the country, have been monitored. The results indicated that aspects of the programme are cost effective and will therefore be used to progress to a more financial sustainable programme.

## Discussion and recommendations

The control programmes in Uganda have been supported by funding from the Bill and Melinda Gates Foundation[34]. This has helped the country to sustain the excellent start in eliminating the morbidity resulting from schistosomiasis[31]. Potential sources of funding that could be expected to assist the active the programmes include those from the Ministry of Health. In addition other international agencies like the European Union, and international organisations such as WHO, the World Bank, the African Development Bank, the World Food Programme and UNICEF have contributed funding towards the control of bilharziasis [31].

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. Additionally, improved sanitation is required before elimination of these infections can be considered a possibility.


## Acknowledgements

We are grateful to Dr. Narcis Kabatereine and the support staff of Vector Control Department Wandegeya for the useful informations on the Schistosomiasis Control Programme.


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