

## A RECENT UPDATE OF SCHISTOMIASIS MANSONI ENDEMICITY AROUND LAKE RWERU

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### ABSTRACT

**Background:** Schistosomiasis remains a global public health challenge with an estimated 200 million cases reported each year. In Rwanda, the prevalence of schistosomiasis was recently examined by a countrywide mapping conducted by the Neglected Tropical Disease (NTD) Control Programme of the Rwandan Ministry of Health in partnership with The Access Project. Unfortunately, that study failed to consider one area of endemicity -- Lake Rweru, located in Bugesera District, Eastern Province, Rwanda. This screening aimed to evaluate Lake Rweru and its environs in order to determine next steps for disease control.

**Methods:** The lake's shore inhabitants, including children and adults, were invited to be screened for intestinal schistosomiasis. The stool examination was performed by Kato-Katz technique.

**Results:** A total of 270 children and adults were parasitologically screened. Fifty seven (57) cases of schistosomiasis mansoni were confirmed (21.1%). The highest proportion of *S. mansoni* infection was observed at Mazane Island (30.1% of 93 island inhabitants screened).

**Conclusion:** The present results confirm that Lake Rweru is a significant source of *S. mansoni* infection in the country. We recommend further future investigations in order to know the true disease prevalence. While the mass de-worming campaign against schistosomiasis in addition to soil-transmitted helminthiasis is being regularly conducted by the Ministry of Health in all endemic areas, the population surrounding Lake Rweru should receive special attention.

**Keywords:** Schistosomiasis mansoni - endemicity - Lake Rweru - Bugesera - Rwanda

### RESUME

**Contexte:** La schistosomiase demeure un problème important de santé publique globalement avec environ 200 millions de cas rapportés chaque année. Au Rwanda, la situation de la schistosomiase a été récemment mise à jour par une cartographie nationale conduite par le Programme de Contrôle des Maladies Tropicales Négligées (MTN) du Ministère de la Santé en collaboration avec The Access Project. Cependant, le lac Rweru situé dans le District de Bugesera, Province de l'Est, Rwanda, a été incorrectement manqué parmi les foyers les plus endémiques. L'investigation visait à confirmer le foyer afin de déterminer de prochaines étapes pour le contrôle de l'infestation à *Schistosoma mansoni*.

**Méthodes:** La population habitant aux alentours du lac Rweru comprenant des enfants et des adultes a été invitée à fournir leurs échantillons de selles en vue d'être examinés pour la schistosomiase intestinale. L'examen de selles a été réalisé par la technique de Kato-Katz.

**Résultats:** Un total de 270 individus (des enfants et des adultes) ont été examinés parasitologiquement. Cinquante-sept (57) cas de schistosomiase mansoni ont été confirmés (21.1%). On a observé la proportion la plus élevée de l'infection à *S. mansoni* à l'île de Mazane (30.1% de 93 habitants insulaires testés).

**Conclusion:** Les résultats actuels confirment que le lac Rweru est une source importante de *S. mansoni* dans le pays. Nous recommandons des enquêtes postérieures afin de connaître la vraie prévalence de la maladie dans cette zone. Pendant que la campagne de déparasitage de masse contre la schistosomiase en plus des géo-helminthiases est régulièrement organisée par le Ministère de la Santé dans toutes les zones endémiques, la population environnant le lac Rweru devrait recevoir une attention particulière.

**Mots-clés:** Schistosomiase mansoni - endémicité - lac Rweru - Bugesera - Rwanda

### INTRODUCTION

Schistosomiasis remains an important public health threat globally with an estimated 200 million cases reported each year [1]. However, as of 2005, 85% of the cases reported annually occur in sub-Saharan Africa [2, 3], mostly among poor people who live in remote areas, without access to health services, safe water, sanitation, and education [4].

Schistosomiasis is caused by worms of the genus *Schistosoma* (trematode worms). The five species infecting humans are *Schistosoma mansoni*, *S. haematobium*, *S. japonicum*, *S. mekongi* and *S. intercalatum*, and

transmission cycle requires specific freshwater snails as intermediate hosts [1, 5]. These worms live in the small blood vessels associated with the liver, intestine and bladder (depending on the species) and cause extreme pathology, morbidity and even death in individuals with heavy, chronic infections. The only human schistosome species prevalent in Rwanda, *Schistosoma mansoni* is most common in Africa but occurs in the Americas as well [6].

The situation of Schistosomiasis in Rwanda was recently updated by the disease countrywide mapping by the Rwandan Ministry of Health in partnership with the Columbia University's The Access Project. The main endemic areas for schistosomiasis were found to be Lakes Ruhondo, Bulera, Muhazi and Kivu [7]. The mapping was school-based and followed the WHO guidelines for helminthiasis control [8].

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## *A recent update of schistosomiasis mansoni endemicity*

The Lake Rweru is located in the South-East of Rwanda (Bugesera District), at an altitude of 1350 m. The total surface area of Lake Rweru covers some 100 km<sup>2</sup>, of which 20 km<sup>2</sup> lie in Rwanda and 80 km<sup>2</sup> in Burundi. This shallow lake is part of the Upper Akagera Lakes Complex, and has a shoreline of some 76 km. The mean depth is around 2.1 m with a maximum of 3.9 m [9]. Up to recently, the Rwandan Ministry of Health had no data from the Lake Rweru area indicating the endemicity of schistosomiasis. During the nationwide prevalence survey on Soil-transmitted helminthiasis and schistosomiasis carried out from 2007 to 2008, six primary schools located in Bugesera district have been randomly selected and surveyed. Three of those schools were closely located to other different lakes and Lake Rweru surroundings were not represented in the study [7].

Before the present screening being undertaken, few cases were routinely diagnosed among outpatients at Nzangwa Health Center located at approximately 10 km from the Lake Rweru. After the routine detection, a joint mission of laboratory technicians from the health center and Nyamata District Hospital performed a stool microscopy for one hundred lake-shore inhabitants from whom four cases were detected. This observation has raised more attention and alerted the district health authorities and the Ministry of Health's NTD control Program thereafter for undertaking a more reliable survey. The screening aimed at confirming the focus in order to determine next steps for disease control.

### **METHODS**

#### Study area and population

The study area was the Lake Rweru region and participants were all the lake-shore inhabitants willing to be tested for intestinal schistosomiasis. Few days before the survey team visit the community health workers in the area were contacted and asked to inform the population.

#### Study design

The survey was a descriptive and cross-sectional study conducted in the early November 2009.

#### Inclusion criteria

Children aged at least two years and adult individuals from villages surrounding the Lake Rweru.

#### Exclusion criteria

Children under two years of age and all individuals not residing in the Lake surroundings.

#### **Survey team, training and data collection**

A 3-day refresher training for 12 laboratory technicians from 12 health centers of Bugesera District was anticipated and held at Nyamata District Hospital from 2 to 4 November 2009. Trainees were familiarized with laboratory diagnosis of schistosomiasis and intestinal worms using Kato-Katz

method. For the last day, the half of trainees led by a senior trainer from the National Reference Laboratory (NRL) and a supervisor from the NTD Programme went to the Lake Rweru area to undertake stool samples collection among lake-shore inhabitants. The data collection took two days. The stool microscopy was performed at Nyamata health center .

The Screening was based on examining from each participant a single 41.7 mg Kato-Katz smear, prepared from a fresh stool sample and left to clear for 10-30 minutes [10-12]. The smear was examined in a systematic manner and the number of eggs of each species reported. Later, this number was multiplied by 24 to obtain the number of eggs per gram of faeces (epg). The Kato-Katz thick smear technique is the standard technique recommended by the World Health Organization (WHO) for the quantitative diagnosis of *Schistosoma mansoni* and other intestinal helminth infections [11].

### **Quality control**

The consistency of microscopic results during the survey was verified for quality control. Each day during the survey, the senior laboratory technician (and trainer) from the NRL had to read at least 10% of the slides handled by each microscopist without prior knowledge of the results. In the case of any discrepancy, the slide was discussed by the survey team further slides were examined to avoid repeated errors.

### **Statistical analysis**

Data were collected using a record book (register). Data entry and analysis was done using Epi Info 3.2.2.

#### Variables:

Demographic characteristics: age in years, sex and residence (cells/villages). The number of eggs was expressed in eggs per gram (epg) for *S. mansoni*, *A. lumbricoides*, *T. trichiura* and hookworm.

We calculated the proportion of persons with each of helminths mentioned above, a case was defined as a person with at least 1 egg in the faeces. Arithmetic mean was used to calculate mean intensity. The intensity of *S. mansoni* infection was classified according to the WHO recommended thresholds (light: 1-99 eggs per gram, moderate: 100-399 epg, heavy:  $\geq 400$  epg) [8].

### **Ethical considerations**

The stool screening for schistosomiasis among the general population around Lake Rweru intended to collect additional data to the national mapping whose protocol was reviewed and approved by both Rwandan National Ethics Committee (RNEC) and the Columbia University's Institutional Review Board (IRB). Before collecting samples, aims and procedures to be used to collect data were explained to



## DISCUSSION

The present investigation on intestinal schistosomiasis around Lake Rweru confirms the presence of *S. mansoni* infection with the proportion of infected individuals of 21.1%. This suggests probable high prevalence of the disease among the lake-shore inhabitants. Great spatial variation of infection detection was observed in the three visited sites. The proportion of infected individuals at each site was 30.1%, 24.6% and 1.6% at Mazane Island, Nyiragiseke Village and Mujwiri Village, respectively. Schistosomiasis occurs in focal pockets and is closely linked to the presence of water bodies that harbour susceptible species of snails. The spatial variation of the presence of infection around the same water body has also been observed elsewhere [7, 13, 14]. The highest proportion of infected individuals was observed among individuals living in close proximity to the lake (Mazane Island and Nyiragiseke Village) which is the only source of water for the community. Only one case of *S. mansoni* infection was diagnosed at Mujwiri, a place with piped water and where people are sensitized for respecting distances of 50m from the lake for environmental benefit according to the Environment Protection Law.

Several studies on schistosomiasis have tended to focus on school-age children and adults, with little or no emphasis on pre-school children, and where pre-school children are part of the study, information about them was often subsumed [15,16]. The results of this survey have shown that pre-school children also harbour infection and are a source of transmission of schistosomiasis in endemic communities. From our observation and discussions with parents we have learnt that infection of pre-school children early in life was due to exposures through bathing in the lake by their mothers, while the older children would visit the lake for washing, fetching of water, bathing and swimming. These findings are consistent with the observations of the study conducted in Nigeria by Uwem Ekpo et al. [17].

The most recently published data from the Burundian side of Lake Rweru indicates this area as a highly endemic focus for *Schistosoma mansoni* infection [18].

For other parasitic infections (STHs), people were mostly infected by hookworm (33%) followed by *T. trichiura* (22%) and *A. lumbricoides* (12.2%). Previous data showed that hookworm was the predominant STH in the Eastern Rwanda (East Province) [7].

## CONCLUSION

The present community-base survey provides important information on the status of schistosomiasis mansoni among the population around Lake Rweru and confirms that this area is a significant source of the infection in

the country. We recommend further investigations in order to determine the true prevalence of this infection and to plan for disease control accordingly. Another option is to immediately undertake the mass education campaign for prevention along with the annual mass deworming and advocacy for safe water supply for the lake-shore population. The results show that pre-school children also harbour *S. mansoni* infection and are therefore also source of transmission in endemic communities. Although currently excluded from mass treatment programmes, provision for their inclusion in treatment programmes is imperative and should be considered.

## Limitations of the study

Duplicate Kato-Katz smear from each individual is recommended for epidemiological surveys for good sensitivity but only one smear was prepared and examined for practical and logistical reasons. Duplicate smears would require additional time and budget which were not initially planned by the NTD Program.

## Acknowledgements

The survey received financial support from Legatum, Geneva Global (GG), Global Network for Neglected Tropical Disease Control (GNNTDC) and Sabin Vaccine Institute (SVI). We are grateful to the participants who provided the stool specimens without which this exercise would not have been accomplished.

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