

Letter from Field



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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Comprehensive NTD elimination project in Mayuge district, Uganda to effectively eliminate schistosomiasis and soil-transmitted helminths

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Editor's note: Dr. Eun Seok Kim is an infectious diseases specialist and health specialist of World Vision.

Four years ago, I worked in Kirudu Hospital as a visiting physician in Kampala, Uganda. One day, I went to an endoscopy room in Kirudu Hospital, where I met a young man in his early twenties. I was curious why this young man came to the endoscopy room because he was too young to come to endoscopy room as a patient. A Ugandan gastroenterologist in charge of the endoscopy room explained that he had an esophageal varix bleeding a week ago and came back for follow up endoscopy examination. Then again why did he have esophageal varix? When I reviewed some published articles, I soon learned that there were huge diseases burdens of neglected tropical diseases (NTDs) in Uganda. Esophageal varix was one of common chronic complications of schistosomiasis (SCH) which is a representative NTD. During my stay in this country, I have realized that this young man's case is not uncommon in Uganda.

Unsurprisingly, half of Ugandan population is at risk of contracting at least one of NTDs. Despite the high burden of NTDs, the people in Uganda, including health officials, go about each day with relatively little concern for the imminent danger that NTDs pose to their communities.

Uganda has many beautiful lakes, such as Lake Victoria and Lake Albert, which attract many tourists each year. Despite their natural beauty, these environments also provide ideal conditions for diverse NTDs to flourish. For example, there is a snail species called *Biomphalaria*; acting as an intermediate host in the life of *Schistosoma mansoni*, which are a blood fluke harbored in water snails and are released into fresh water as infective form (cercaria) to human. Subsequently, people can become infected by the worm in contaminated rivers and lakes. And in their daily life, people frequently contact contaminated water as they use water from river and lakes, or swim and play in contaminated waters. The difficulty in containing the natural reservoirs of *Schistosoma* species, the challenge in diagnosing and treating the disease, and the lack of preventative interventions like vaccination against SCH have resulted in an increase SCH morbidity and mortality in Uganda. SCH is considered one of the biggest public health problems in Uganda and causes 280,000 deaths annually in sub-Saharan Africa alone.

Strategies to combat NTDs in Uganda have been implemented. Since 2003, mass drug administration (MDA) including albendazole/mebendazole, praziquantel, ivermectin, zithromax targeting SCH, soil-transmitted helminths (STH), lymphatic filariasis, onchocerciasis and trachoma was enrolled throughout Uganda. Consequently, magnitude of certain NTDs reduced. In case of onchocerciasis, magnitude reduced from 70% to 7% in most foci in Uganda for the last 10 years. For trachoma, more than 10 million population were at risk of losing their sight due to trachoma but now 300,000 people are at risk as a consequence of national trachoma elimination program. However, further action is required as SCH and STH remain major public health risks in many communities.

World Vision applied for global diseases eradication fund of Korea International Cooperation Agency (KOICA) in August 2017 and successfully awarded the fund for the SCH and STH elimination project. We selected Mayuge district, Uganda as a target area. Mayuge district is an area with high prevalence of SCH and STH even after MDA activities for over 15 years.

Until now, in general, there have been efforts to control diseases rather than to eliminate them. Therefore, MDA was the most important component of NTDs control program. However, it is hard to expect SCH and STH to be eliminated only by MDA implementation. If people are continually exposed to high risk environments such as infected snail populated lakes or rivers, MDA may temporarily reduce the incidence of SCH disease but the disease can reemerge since the natural reservoir persists even when human infection is low. In particular, people who fetch water or wash clothes regularly in contaminated water sources or fishermen who wash their nets in the lakeshore barefoot are at increased risk. Therefore, it is necessary to establish and protect uncontaminated water sources and make use of sanitation facilities as an added protection mechanism for people who live in high-risk areas. And it is necessary to strongly consider controlling the intermediate vector of SCH.

World Vision started Mayuge NTDs elimination (MANE) project in Mayuge district whose population is approximately half a million in April 2019. The project contains MDA, water, sanitation, and hygiene (WASH) and behavior change interventions. MDA is a classical intervention of reducing disease burden in public, and through the WASH intervention, we not only provide clean water and sanitation facilities, but also inform people about the importance of utilizing sanitation facilities and clean water. For this, we are using community led total sanitation (CLTS) (Fig. 1). Communities have taken initiative to build their own latrines and change sanitation behaviors, such as open defecation, through the CLTS. Considering high reinfection rates after the MDA-only program, the WASH intervention has been identified as an essential component of the project and must be done together with MDA for SCH and STH elimination.

Ecological modeling has been applied in the MANE project. The MANE project team created the ecological risk map (Fig. 2). There are several ecological factors that are thought to be associated with risk of SCH; temperature, precipitation, slope, elevation, normal difference vegetation index and proximity to water. In order to better understand the associated risk of SCH throughout Mayuge territories, we used mathematical modelling of these six variables to determine if these climatic and environmental factors predicted areas of high risk for STH. Comparing with the SCH prevalence survey completed in July 2019, we found that there was a high correlation between the prevalence of SCH and the risk area.

In addition, a major component of this project is strengthening health system to sustain the achievement through the project. Training for laboratory personnel was carried out during



Fig. 1. A group of community led total sanitation participants drawing village map.

the prevalence survey. It is an important step to make a correct diagnosis of NTDs in order to treat and prevent them appropriately. In this perspective, laboratory personnel in Mayuge district were taught how to make slides by using the Kato-Katz method (Fig. 3) and also learned how to read the slides by using microscopes by Korean parasitology professors who participated in the prevalence survey.

It is well known that the distribution of SCH is very focal because it is determined by schistosome infected snails and contaminated environment. Mayuge district, it seems, has different risks of SCH due to this character of SCH. We can elaborately selected target areas for MDA for SCH based on the results of the prevalence survey using ecological modelling. And we are carrying out more practical and specific eliminating interventions

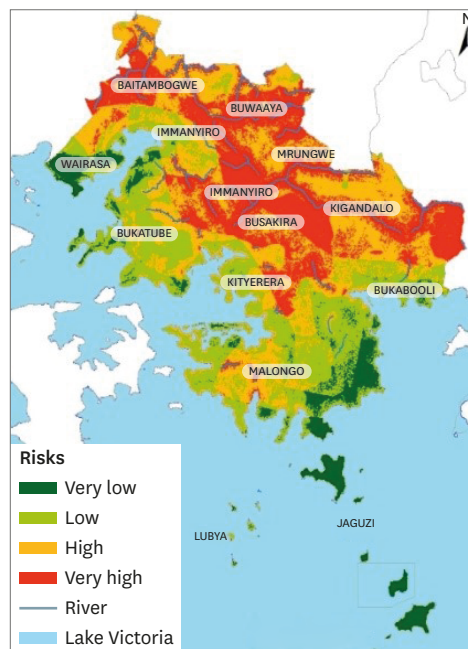


Fig. 2. Ecological risk map of schistosomiasis in Mayuge.



Fig. 3. Training laboratory personnel for making slides by using the Kato-Katz method.

such as school-based education activities, emphasizing how to reduce the risk for SCH and STH transmission. We also identified that hookworm is the most common STH in Mayuge district, which need skin protection to reduce its transmission.

Using a baseline survey, we identified that school aged children are less aware of NTDs compared to adults groups and teachers are not likely to educate students regarding to NTDs. To tackle this challenge, we held school contests on the topic of how to reduce SCH and increase uptake MDA drugs. We also held sub-county and district level school contests in order to increase awareness and spread important messages about simple steps children can take to protect themselves against infection (**Fig. 4**). This activity enlightened the community as well as students the knowledge of prevention from SCH and STH.

Although elimination of NTDs is complex, yet many elimination projects utilize a simplistic approach, such as MDA alone, which is incomplete and lacks efficacy. It is important to acknowledge that NTDs are a persistent problem and risk increases as exposure increases. The long-term goal should be to reduce the conditions of poverty which allow for pathogenic organisms to enter into the lives of millions of people in Uganda and across the world. The elimination of NTDs can only be achieved slowly and steadily as we remove potential threats



Fig. 4. School contest for increasing awareness of neglected tropical diseases prevention.

of NTDs one by one. We expect that Mayuge district will be free soon from NTDs through comprehensive approaches offered by the MANE project funded by KOICA.