

## The Role of Knowledge and Cultural Practices in Schistosomiasis Infection along Fishing Sites: A Case Study of Kasenyi Fishing Village, Uganda.

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**ABSTRACT:** Schistosomiasis is a serious neglected tropical disease in Sub-Saharan Africa. Several studies show that knowledge and attitudes about Schistosomiasis influence infection rates among vulnerable populations adjacent to water bodies, where fishing in lake and rivers is a significant means of livelihood and subsistence, and particular environmental and social contexts also play a role in infection. However, despite abundant research focusing on Schistosomiasis infection and outcomes of national interventions in Uganda, the significance of knowledge, awareness and attitude remains understudied. This study focused on awareness and practices of people along the fishing sites in Uganda, a case study of Kasenyi landing site in Entebbe-Wakiso District, Uganda. The study data was mainly obtained through Questionnaires, interviews and Focus Group Discussions (FGDs). Respondents were randomly selected from within the geographical area of study. A review of literature served as a guide on the historical perspective on various approaches for assessment of the disease, awareness and practices of the people, upon which the co-efficient of the study were formulated and tested. Our core findings are that there was significant knowledge and awareness about Schistosomiasis, however, a gap still exists in practically achieving of the disease, since more than 50% of the respondents were oblivious of the causes, transmission, symptoms, prevention, as well as the treatment of Schistosomiasis. The respondents laid it bare that there exists a need for better training workshops of the local people and leaders about the disease as well as the treatment of the affected persons, to confer better protection to those at risk of infection. For people to acquire knowledge, there must be proper flow of information about the disease. This flow often times being broken by attitude, work, and language barrier among others. This has inadvertently led to practices in society that encourage the spread of schistosomiasis in the area.

**KEYWORDS:** Schistosomiasis, awareness, Prevalence, risk factors

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Date of Submission: 19-04-2020

Date of Acceptance: 03-05-2020

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### I. INTRODUCTION

#### 1.1 Research background and literature review

Schistosomiasis, one of the most neglected tropical diseases is widely spread by parasitic water-borne vectors particularly the blood-fluke from genus *Schistosoma* [1] and is currently affecting approximately 240 million people worldwide, with more than 800 million predisposed to risk of infection [2]. Sub-Saharan Africa accounts for more than eighty-five percent of the global Schistosomiasis prevalence, with annual deaths of about approximately 280,000 people and the most common vectors of schistosomiasis in Africa are the blood flukes *Schistosoma mansoni* and *Schistosoma haematobium*. In Uganda, Schistosomiasis has long been a serious public health challenge, affecting more than half of the total population, currently estimated to be 45 million people, with people living along the shores of Lake Albert and Lake Victoria being severely considered high risk populations to infection [3-6]. Schistosomiasis (also referred to as bilharzia) is caused by adult blood flukes (parasitic trematode worms) depositing eggs in blood vessels surrounding the bladder or gut of the infected host. Snails serve as the intermediate host for schistosomiasis and the disease originates with the improper disposal of human faeces or urinal disposal. The snail, the intermediate host, plays a critical role in ensuring the survival

and development of the miracidia that hatches from the disposed eggs. This justifies the role of society sanitation practices towards in the control of the schistosomiasis disease. Upon infusion into the human body, the parasite locates itself in the host body parts and starts to hatch eggs into the body system depending on the species for example *S. mansoni* which is common in tropics occurs mostly in superior mesenteric veins draining the large intestine while *S. haematobium* mostly settles in the venous plexus of bladder as well as rectal venules [7]. Diagnosis mainly involves microscopic analysis of the patient's 'stool' for *S. japonicum* or urine for *S. haematobium* parasites. However, if the eggs are released in small amounts, it may not be detected and thus a need for a serological (blood) test to determine its presence in the host patient.

Schistosomiasis is widely recognized as a disease that thrives in particular social and environmental contexts, therefore, our understanding of knowledge, attitudes, and culture in areas of prevalence is critical for control and prevention efforts. It is also well established that poverty is a major driver of Schistosomiasis [8, 9] and poor people especially in the case of Uganda inhabit ecologically vulnerable places and where disease prevention is difficult. Schistosomiasis survives in poverty-stricken, remote areas because there is often little or no safe water or sanitation, and health care facilities are scarce or even non-existent. Given these social dynamics, addressing Schistosomiasis calls for more community involvement and mobilization to go in tandem with national and private sector intervention efforts. There have been tremendous integrated efforts and approaches in Uganda towards complete eradication of schistosomiasis through research and mass drug treatment of high risk population demography particularly children aged 1-10 years [5]. These efforts have largely involved support programs, collaboration and funding by donor agencies and partners like RTI International, US Agency for International Development (USAID), the Schistosomiasis Control Initiative, funded by the Bill and Melinda Gates Foundation, and the Uganda national control Programme for schistosomiasis [3, 10]. For example, studies on the epidemiology of intestinal schistosomiasis in Uganda have largely gravitated towards children between the ages of 6–15 years and adults in high-risk occupational groups like fishermen [11, 12].

Oniya [13] noted that schistosomiasis is an important water-borne tropical morbidity disease that is increasing in the tropics as a result of landscape changes associated with the building of dams and the expansion of irrigation. It is claimed to be primarily a disease that results from lack of education, public health facilities and poverty. This is because it has been found to persist in rural marginalized areas of Sub-Saharan Africa whose people are often subsistence farmers living on low incomes and with poor education [14]. Espino, et al., [15] acknowledges that the presence of this disease within communities does not only cause illness to those infected, but may as well impact on the socio-economic development of the entire household. Regardless of the above, majority of the people in schistosomiasis prevalent areas do not seem to have correct knowledge of schistosomiasis. Integrating health education and medical intervention remain a high priority for the World Health Organization's (WHO) schistosomiasis control programs.

## **1.2 Research aim and objective**

Whereas most done researches on knowledge and practice sought to establish the rationale of the communication channels about schistosomiasis, this research assessed the role of knowledge, awareness of risk factors for Schistosomiasis infection along Fishing Sites using a case study base on Kasenyi Fishing Village in Uganda, with the aim of drawing a clear roadmap for policy development and best approaches to tackle the spread of the disease.

## **II. RESEARCH METHODOLOGY, DATA AND SAMPLE**

### **2.1 Schistosomiasis prevalence in Uganda and the study area**

#### **2.1.1 Schistosomiasis prevalence in Uganda**

Schistosomiasis remains widespread in Uganda. Loewenberg [3] in his assessment of the disease and its impact on the country projected that more than 4 million people are estimated to be infected with schistosomiasis in Uganda, and about fifty-five percent of the population of Thirty-six million are thought to be at risk. The infection rates vary widely, from ninety-two percent in some areas to as little as two percent in others. It is not just a rural problem, either. One study found sixty-five percent prevalence in a district of Kampala, Uganda's capital city. Along with other Neglected Tropical Diseases (NTDs), it threatens the attainment of the Sustainable Development Goals (SDGs). With sanitation and provision of safe drinking water a chronic challenge in Uganda, and children routinely playing from the shores of the lakes, schistosomiasis has persisted, and numerous control efforts have largely failed to achieve results [16]. Much of schistosomiasis infections in Uganda has occurred over the last three decades despite extensive national programs funded through foreign aid and by philanthropic organizations. A case in point is the support of the Bill and Melinda Gates Foundation through the Schistosomiasis Control Initiative [16]. Uganda's natural and physical environment present some unique challenges that exacerbate Schistosomiasis infections. Lake Victoria is the

biggest freshwater lake in the country, Landlocked, many people in Uganda have their lives entirely dependent on the lake.

Whereas schistosomiasis *Haematobium* is rare in Uganda and is only found in a few districts around Lake Kyoga, schistosomiasis *Mansoni* manifests in seventy-three of the total hundred and twelve districts of the country. It is estimated that about sixty percent of the locals around lakes Albert, Victoria, Kyoga, banks of River Nile and the rice fields in Eastern Uganda are infected with schistosomiasis [3]. The national program to control the disease was initiated in 2003 with an objective of controlling morbidity through regular chemotherapy of at-risk communities as identified basing on WHO mapping protocol. Ministry of Health projects that about 5.4 million Ugandans are infected while 13.9 million people are at risk of infection. The administration of Praziquantel in forty-three moderate endemic districts has greatly reduced morbidity and the ministry of health projects that with further administration, they will be in line to eliminate schistosomiasis by two thousand and twenty as planned by WHO [16].

Behavior and water handling are important routes for Schistosomiasis infection in Uganda and elsewhere in Sub-Saharan Africa. Presently, only twenty-eight percent of Uganda's population wash their hands with soap after visiting the toilet. In schools, there is one toilet for every seventy students. However, this shows a greater improvement as by 1997, there was a ratio of one toilet available to three hundred and twenty-seven students. In business areas, the situation stands at a worse ratio. Their usage is reduced by the fact that they are charged for usage a price of Ugx.200/= to urinate and Ugx.500/= other needs. This cost is proving high for people who opt for poor disposal of the waste to avoid payments. It was as well discovered that males have poor disposal and kids in society compared to women [17]. Yet sanitation has been marginalized by the Ugandan Government; according to the World Health Organization, only thirty-five percent of the 43 million Ugandans have access to improved toilet facilities [18].

With limited foreign aid towards sanitation, the Ugandan government lacks the capacity to handle it on the basis of the tax base that is still low and unable to sustain the economy. Some foreign aid officials suggested the government was trying to pump up its numbers to show progress. Uganda ranks 149 out of 175 in Transparency International's Corruption Perception Index. There is a hope that a reduction in corruption, abuse of human rights and a manifestation of democratic principles of governance might see an increase in funding of sanitation programs [19]. USAID, for instance, has spent about \$300 million globally on water, sanitation, and hygiene per year, with only about fifteen percent of that for sanitation. Sanitation is not just a rural problem. For instance, in Kampala, only ten percent of the city has sewage coverage—mostly wealthy residential and business districts [20]. Much of the rest of the population relies on pit latrines. In the crowded housing and unpaved roads of the slums, trucks cannot get access, so the latrines fill up within a few years and are then not emptied. Not only do they then become unusable, they often overflow when it rains. Residents are forced to illegally empty their latrines into open gutters.

### **2.1.2 The study area**

Kasenyi fishing village, on the gridlines 0°3'14.46" latitude and 32°31'8.07" longitude in Entebbe Municipality, Wakiso District, in the central region of Uganda (Fig.S1). It is approximately 5.5km off Kampala-Entebbe main Road and has been in use as a landing site since 1960's. The landing site has a total population of 5400 people, with 1864 women. It has a fishing site, market and partly residential. Many people moved to the site in search for employment as fishermen, fish mongers and other retail business owners. The prevalence of the fishing as a major livelihood has rapidly led to the growth of the area in the last two decades.

Kasenyi's location as a landing site by the lake banks, which harbor's snails makes it an ideal location for this research. We spoke to people located in the area to establish knowledge, patterns, trends, as well as practices towards schistosomiasis. The statistics from the CDC Uganda indicate that the location of the area near the largest freshwater lake in Uganda influences the rate of schistosomiasis infection. Coupled with the economic activities of fishing, trading and farming in the neighboring areas, it represents a suitable area to uncover knowledge, practices, and misconceptions about schistosomiasis.

## **2.2 Research Methodology**

### **2.2.1 First Step: Ethical clearance**

Ethical clearance to conduct the research was sought from Kasenyi Local Government through the local council (LC) leaders specifically the LC1 and LC3 chairpersons of Kasenyi village. Prior to the study, the study team visited the area to discuss with the local leaders about the objectives of the study and implications henceforth. We also had to interact with the LCs in organization of participants for FGDs.

### **2.2.2 Second Step: Household survey**

Data for this study were collected using household surveys and focus group discussions (FGDs). Focus Group Discussions (FGDs) were used to engage participants in order to establish the knowledge and practice of

people towards the control and preventions of schistosomiasis among the people. Focus group discussions are particularly helpful when participants are busy as it allows multiple perspectives to be shared within a shorter time, and they are important for allowing social interactions among research participants in a way that can facilitate information sharing[21, 22].

During the FGDs, the key areas of discussion ranged from what they knew about schistosomiasis as a disease, prevalence, causes, transmission, symptoms, prevention and treatment of the disease. They were also asked about the dangers they faced while staying near the lake, what ought to be change to avert the challenges so faced with the disease. In total, we conducted FGDs in groups of ten respondents in each and a total of ten group discussions were held over the duration of the study. Respondents were recruited from the Kasenyi market and other nearby neighborhoods with the help of LCs. The researcher carefully moderated the discussion to allow all members of the group, including males, females, children of school going ages, to share their views and knowledge about schistosomiasis. Focus group discussions were recorded through note taking.

In addition to the FGDs, we also administered survey questionnaires to enable us triangulate data from two different sources. The questionnaires also allowed us to reach those members of the study population who were uncomfortable to speak during the focus groups. As such, individual participants were recruited from the local community. Given the busy nature of the respondents, the questionnaires were given to them for seven days to allow enough time for them to complete. Research assistants interpreted the questionnaire to those respondents who could not read. The privacy of the respondent was paramount and there was no part in the questionnaire that required the respondent to write his or her name. Out of the 200 copies distributed, a total of 176 were received back, which is sufficient response rate to allow for rigorous analysis. The surveys were carried out for thirty days in March 2019. Sundays were used to organize logistics for the study as most participants were unavailable. Sample size was calculated using single population proportion formula, by considering the level of significances at five percent, a national schistosomiasis prevalence of fifty percent and five percent marginal error. Hundred individuals were interviewed independently and correlate the viability of the information, they were randomly pooled into different Focus Group Discussions (FGDs). The study population comprised of school children as well as adults with age ranging from fifteen years to sixty-five years. The participants were organized in three age groups young (0-24 years), adults (25-44) and elders 44 years and above. The number of participants in each age group was estimated in accordance to population distribution by age in each of the study areas as provided in as per the 2010 National Census.

### **2.3 Data**

The data from both questionnaires and FGDs was predominantly relied upon and averages used for validation of the themes of the research. Quantitative data from questionnaires involved analysis descriptive statistics that helped summarize the characteristics of the study participants.

Analysis of qualitative data placed emphasis on the interpretation, description, and recording/writing of what was actually said. The transcripts were first created in the local language, translated into English, and back-translated into the local language to ensure that the English and local language versions carried the same meanings. The commonly spoken language in the area is Luganda with majority of the respondents having only attained elementary education, it was best to have the questionnaires translated for them to give adequate and reliable information on the topic of research. Those that were comfortable with English questionnaires were given to them. The research team sorted data transcripts and data analysis, one sample t test (for information sources) and paired t tests (for education and awareness) were determined using GraphPad prism software.

### **2.4 Sample**

Fig. 1A, presents the distribution of respondents that participated in the study. It was evident during the study that women were more available and willing to participate than men. Out of the hundred people that voluntarily availed themselves to participate, 75% were females and 25% male. Even after giving them the questionnaires, out of the 155 females that received questionnaires, only 6.45% were unable to return the questionnaires. However, of the 45 males received questionnaires, approximately 68.89% returned the questionnaires. In addition, results from FGDs showed of the 30 men who participated in FGDs, some only participated because of the leadership positions that they held in the area. One of the male participants was quoted lamenting that “you keep on disturbing us with research because we are leaders.” We speculate that the low numbers of male participants could be attributed to work since in majority households, the man is the ‘breadwinner’ and thus had no time.

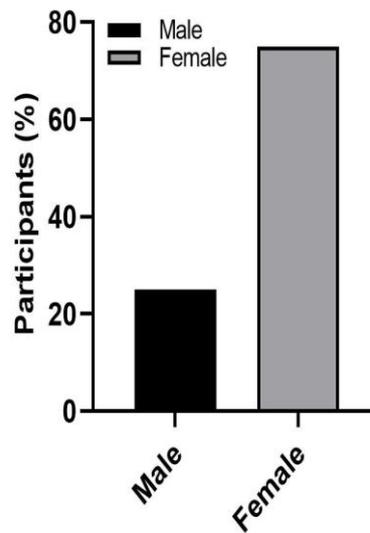


Figure 1A: Distribution of respondents

On the element of the age of the respondents, results indicated that the highest percentage of the respondents (44%) were aged between 28-37 years, while 23.55% were 38-47 years old. For 18-27 years old the total percentage of respondents was 14.22% which was slightly higher than 9.33 and 8.89% for 0-18 and 47 and above year olds (Fig.1B).

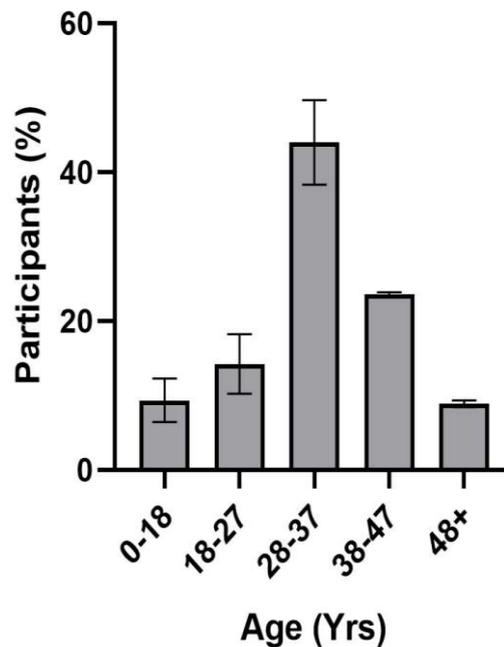


Figure 1B: Age of the respondents

It should be noted that during the FGDs, most females were reluctant to tell their true ages. The averages of thirty-two years first obtained during the FGDs heavily deviated from the averages of thirty-six years with the questionnaires (data not shown). This was probably because the questionnaires never required a participant to write the name on the form and hence individuals were inclined to give more accurate information to the element of age than the FGDs. When we asked one of the male participants why there was an age differential from what we had obtained from the FGDs and the questionnaires, he was quick to point out that some women are dating young males at the fishing site and any true disclosure of the age could possibly affect their relationships.

### III. EMPIRICAL ANALYSIS AND RESULTS

#### 3.1 Schistosomiasis awareness and Education level

##### 3.1.1 Demographic Correlation of schistosomiasis awareness with education level in Kasenyi

To correlate the education level of participants with the level of knowledge or awareness of schistosomiasis, we divided the respondents into three age groups that is; young (0-24), adults (25-44) and elders (45 years above). Results showed that the education level of young participants was highest at 59.77% followed by that of adults, which was approximately 35.29%. The elderly participants were least educated with only 14.94% having had any formal education (Fig. 2A). This could be as a result of increased school enrolments due to government programs like free Universal primary and secondary education [23, 24]. Furthermore, comparing education status and knowledge or awareness about schistosomiasis, revealed that majority of respondents who had no formal education also were not aware of the disease, hence disease awareness could be attributed to the level of formal education. Specifically, 74.58% of the respondents categorized as young were aware about schistosomiasis, while 56.46 and 41.74% were aware about schistosomiasis among the adults and elderly, respectively (Fig.2 A).

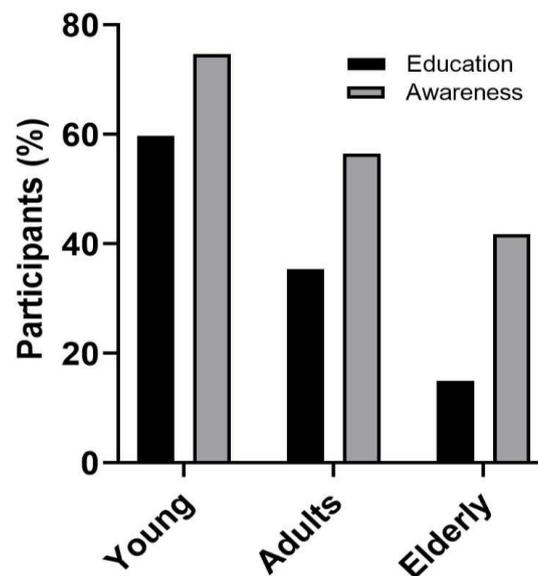


Figure 2A: Education and Schistosomiasis awareness correlation

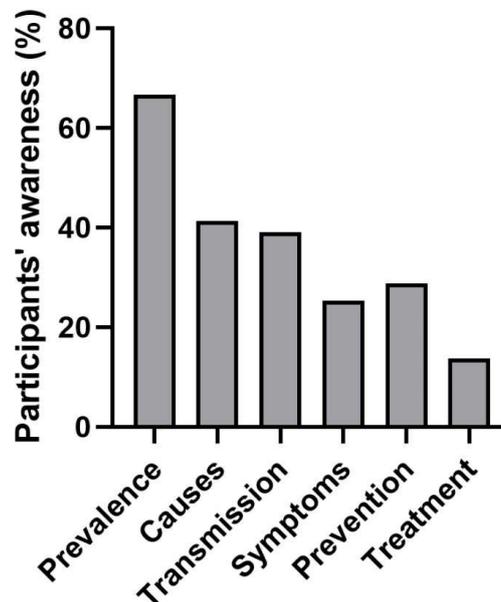
With majority of the people at and around the fishing site doing casual work and or doing retail businesses for survival, it is evident that there is a very big gap between the knowledge and practices of the people. During the FGDs, some respondents were quick to note that during health workshops, the health workers do not comprehensively translate the terminologies into simpler terms or in native languages that they can best understand. This has all affected the flow of information thereby affecting not only the spread of the disease but also the practices that encourage its prevalence.

During the FGD interactions with the people of Kasenyi Fishing Village, we established that the word “schistosomiasis” was alien to them. Only a few that had attained some elementary education knew that schistosomiasis is the same as “bilharzia”. It is remarkable to note that one respondent even regarded schistosomiasis as elephantiasis while another construed schistosomiasis to be a scientific name for malaria. This clearly demonstrates how knowledge and awareness play a critical role in the fight against diseases in rural populations.

##### 3.1.2 Correlation of schistosomiasis awareness with education level in Kasenyi based on paired t test analysis

To demonstrate the relationship between education and disease awareness, we carried out a paired t test analysis and results showed there was a significant correlation between education status and awareness of schistosomiasis with a Two-tailed P value of 0.0263. We further assessed the respondents’ awareness for the; prevalence, causes, transmission, symptoms, prevention and cure following of schistosomiasis. Results revealed a high awareness about the disease with 68% of the respondents having heard about schistosomiasis (Fig. 2B). This was almost in line with previous study by Exum et. al., [16] that 61.8% of the study population had

knowledge of the disease. The high percentage of awareness of schistosomiasis could be associated with increased health education workshops and seminars [16], educative programs on radio and TV among others. Evidently, there was association between having suffered from schistosomiasis and having knowledge of the disease. Results show that 82.35% of the respondents who were aware of schistosomiasis had previously suffered from disease (TableS1), implying that participants who had suffered from schistosomiasis could have learnt about the disease when they went for treatment at health centers or when they attended health camps, trainings and workshops. Exum et. al., [16] had previously also reported that approximately 95% of respondents who had prior knowledge of the disease had previously been infected with schistosomiasis. Additionally, 41.38 and 39.08% of the respondents were aware of the causes and transmission of the disease, while only 25.29% knew the symptoms of the disease (Fig.2 B). These results indicated that majority of the respondents were not knowledgeable about the causes, transmission and symptoms of schistosomiasis. This observation ultimately reveals that probably the community had not fully taken advantage of opportunities to learn more about the disease despite staying in a high-risk area. It could also highlight the current approaches used for health education and spreading vital information and also people's attitudes. This observation could also be related to the fact that during FGDs, majority of the participants reported that when they visited health centers, they had not been diagnosed or told by health workers that they have the disease. The percentage of respondents that were aware of prevention treatment methods for schistosomiasis was 28.74 and 13.79%, respectively.



*Figure 2B: Education and Schistosomiasis awareness correlation based on paired t test*

Those results raise serious concerns on how vital health education information could help in alleviating the effects of not only schistosomiasis but also other common vector borne diseases in Uganda. Loewenberg [3] reported that although a lot of effort to prevent the spread of the disease were in place, there were still challenges facing the government-aided health system for example the programs do not have wider coverage up to the village level. In relation to Kasenyi landing site, the inner parts of the island and some small neighboring islands are inaccessible, thus receive barely any help. Moreover, the mass treatments programs are mainly administered by volunteer community health workers who in most cases are not well facilitated and thus demoralized thus opt to seek for paying jobs elsewhere. He further quoted in his report that Uganda's disease burden is manageable since three quarters of it were sanitation related. This quote echoes a similar statement by Professor Alan Fenwick of Imperial College, London who once said that for schistosomiasis to be completely eradicated from this planet, everyone ought to have access to clean water and sanitation. Moreover, funding for sanitation initiatives had previously received low priority from donors too. For example, USAID provides approximately \$300 million for global water, sanitation, and hygiene programs per year, limiting only 15% of this for sanitation programs. There is need for increased funding for sanitation related programs if the goal of complete eradication is to be realized.

### **3.3 Awareness of the socio-economic/cultural risk factors associated to Schistosomiasis Infection**

To demonstrate awareness of the socio-economic and cultural activities that significantly predispose individuals to Schistosomiasis infection, we tailored the questionnaires and FGD questions such that the data

would provide insight and an overview on the awareness and knowledge of the risk factors associated with Schistosomiasis hence enabling us determine the relationship between awareness and risk factors associated schistosomiasis. This data would be paramount in the design and development of sustainable community-based approaches to control infection. Results showed that 91.95 and 86.21% of the respondents considered defecation into the lake and drinking lake water as the primary risk factors for Schistosomiasis infection. Washing clothes or household utensils directly in the lake was considered by 62.07% of the respondents while 54.02% thought swimming contributed to Schistosomiasis infection. Finally, 38.44 and 39.08% of the respondents regarded household (HH) sanitation and African Traditional healing (ATH) methods as the cause of Schistosomiasis infection (Fig.3).

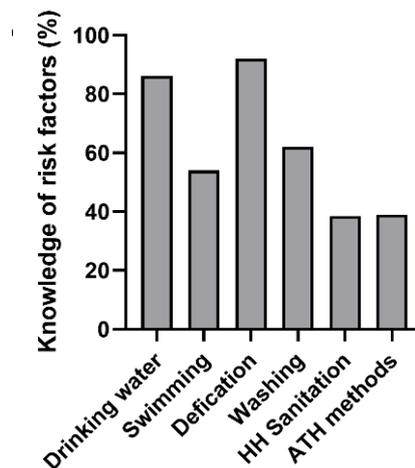


Figure 3: Cause of Schistosomiasis infection

We speculated that a high number of respondents considered defecation and drinking water probably due to increased awareness campaigns on radio against these activities. In reality however, enormous challenges still exist in these communities for example; Loewenberg [3] noted that the diseases, although strides have been made in treatment of Schistosomiasis as well increased awareness through community based health education in these areas, there was a huge deficit of toilets and sewage disposal facilities, and this presents a dilemma to individuals in these fishing communities who ultimately have no options but to openly defecate at the lake shores. Exum et., al., also reported that the prevalence of schistosomiasis was closely related to water and sanitation practices and as such was highly prevalent in individuals who defecated on water surfaces. We suspected that defecation exposed such individuals to infection due to contact with infected water surfaces. When respondents were asked what they knew to be responsible for the schistosomiasis in humans, a significant number of the respondents were quick to attribute it to drinking water. Although the local area forbids the usage of water from the lake in the day-to-day activities, many discover this as directive by the authorities. This is because access to clean water is challenging and residents often have no choice but to rely on the lake, despite being aware that it is contaminated and unsafe. One local fishmonger in the market reported that residents rely on the lake because tap water is expensive, and it is inconvenient to walk longer distances to where the tap water sources are located. This response was similar to that noted by Loewenberg, [3] quoting one of the residents expressing his frustration with government officials who regularly promised to provide safe water to these communities, yet nothing changed. Many respondents also regarded swimming and washing as risk factors since they involve direct contact with water. It was also observed that several correspondents thought that seeking traditional treatment for urinary tract symptoms was a risk factor that predisposed them to infection. We speculate that this could be due to the hygiene conditions encountered and also the crude methods or tools used by traditional healers. The topic of traditional healer's relationship to high risk of infection from schistosomiasis requires further detailed study.

#### IV. ROLE OF INFORMATION CHANNELS IN CREATING AWARENESS

Nalugwa et. al., [5] focused on the magnitude of the effects of *S. mansoni* on preschool children (PSC). Their study was driven by the fact that there still was limited information on prevalence of Schistosomiasis in PSC. To the best of our knowledge, knowledge and awareness of Social, cultural and economic factors that predispose individuals to Schistosomiasis was still limited. Therefore, to establish how different channels influence knowledge and awareness at Kasenyi landing site, we designed our questionnaires having related questions and similar questions asked during FGDs. Results showed that 83.91% of the respondents obtained

vital health information via the radio, while 65.53% from health centers in form or workshops, seminars and health training programs. Meanwhile 39.08% and 14.94% acquired health information through TV and local newspapers. However, only 4.59% used the internet for accessing health information (Fig.3 A). FGD results also showed that radio stations were an important source of knowledge and the internet was the least likely source of information on schistosomiasis. Analysis of the data using sample t test showed the P value (two tailed) of 0.0493 indicating significance. Largely, this data is in agreement with a previous study by Nobelius et. al., [25] that radio is considered as the most reliable source of information about not only sexual and reproductive health issues but also general health information with mainly health education radio-plays designed by the Ministry of Health and health radio talk shows hosted by renown doctors being particularly popular. The popularity of health talk shows is associated with the inclusiveness of their approach in that people get to call on the show and interact with the doctors directly about their health problems. The moderately high contribution of health center organized workshops, seminars as a reliable source of health information could also be associated to the Community-based education (CBE) approach, which is included in the curriculum as part of training of health workers in Uganda [26]. These programs are mainly aimed at acquiring reliable information, knowledge and understanding of health challenges in individual communities so as to design appropriate approaches to solve them. It also enables health workers obtain understanding the health and social services; develop interpersonal skills and teamwork since they are involved in direct interaction with vulnerable people in the community, as well as enabling them play a significant role in contributing to health awareness, leading to prevention of ill-health in these communities [27]. These programs have been beneficial in the fight against diseases like Schistosomiasis. The low usage of internet as a reliable source of health information could also be attributed to majority of the participants being semi-illiterate and not embracing the internet in their lives despite possessing smart phones. Additionally, unfavorable government policies like the direct tax on internet use popularly known as ‘OTT’ or ‘over-the-top’ [28] have also contributed to high costs of internet in Uganda thus low use of internet, especially in rural areas. Respondents were also asked about the source they regarded as most useful for obtaining reliable information on health and overwhelmingly, 94.25% considered radio as the most reliable source (useful), while 87.35% said health center workshops and seminars (Fig.4). In addition, 28.73, 19.54 and 3.45% regarded TV, newspapers and internet as being very useful for obtaining health information, respectively.

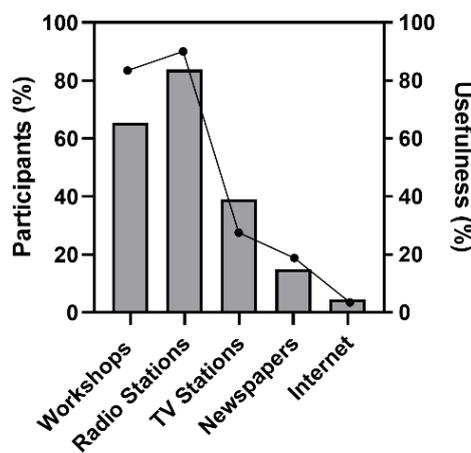


Figure 4: Channels of informations (%)

## V. DISCUSSION

This study demonstrated that knowledge, awareness of prevalence of schistosomiasis was high at Kasenyi fishing village, this could largely be attributed to health education programs on local radios, and community-based health education programs organized at health centers. Moreover, there was a direct relationship between the education status, age and awareness of the disease as approximately 75% respondents categorized as young were aware of schistosomiasis compared to 56.46 and 41.74% for the adults and elderly, respectively. This observation indicated that formal education may played a role in creating awareness about health, hygiene and sanitation. It could also be associated with curiosity and interest of young individuals in finding out information not only about health but also about other social life, economics, politics among others and this is evident in our findings that a majority of the respondents considered radio as the most reliable and useful source of information. Recent reports also indicated that prevalence of schistosomiasis remained high in communities living near Lake Victoria despite existence of preventive measures like mass drug administration [16]. The results correlated with previous studies that indicated that prevalence of helminth infections was high in low-income settings, where access to water and sanitation was limited [29, 30].

Furthermore, results showed that the different categories of media played an important role in harnessing and dispensing information on Schistosomiasis. Finding crucial means of passing on information to the people anytime, anywhere is of great significance as people do not necessarily need to forego their daily work and to attend health seminars or workshops in order to acquire knowledge. Radio therefore significantly played this crucial role, no wonder a majority of the participants regarded it as the most reliable source of information. Given that most respondents complained about the technical language used during the trainings, information shared during workshops and health education programs should be translated into local languages to enable the people obtain the information without much difficulty. The study also revealed that access to information via the internet was still very low in the community and this was associated to high costs involved.

Our findings also showed that awareness about socio-economic and cultural risk factors was high with 91.9 and 86.21% reporting defecation and drinking water as the major risk factors to Schistosomiasis infection. There was a significant gap though between awareness and practicability of the situation as previously noted that access to safe drinking water, latrines and sanitation was still very low. This justifies the need to intensify health/sanitation promoting programs and campaigns that not only teach and disseminate information to members of the fishing community about the dangers of certain practices but also practically availing safe clean and affordable water as well as community initiatives on latrine construction residents in these vulnerable communities.

## **VI. CONCLUSION**

The findings of this study show that the level of people's knowledge and awareness of schistosomiasis within the fishing village was significantly high. Although, the study sample size was limited, the findings still revealed that a more practical community-based approach is needed to ensure safety against infection. Increased awareness of the disease, causes and risk factors could be associated to increased introduction of health education programs in the communities delivered through various channels like radio, seminars among others. Government formal education programs like UPE and USE have also empowered local communities in obtaining knowledge and awareness about health, sanitation and hygiene practices since many young people are enrolled. However, it should be noted that a lot still needs to be done to make practical outcomes from the knowledge acquired. The high costs involved in the research about the treatment and the administration of the drugs to the people could be avoided if proper community specific strategies are put in place to ensure that these vulnerable communities have access to safe drinking water and sanitation. The fact that the disease is humanity-driven, so, can the same populace be used in its fight to extinction. Not only the central government should come up with a proper working plan to ensure that the right kind of message about the disease is brought to the people through channels that will ensure a proper means of deliverance. This could also be supplemented by NGOs, local government units as well as civil society organizations. Whereas most of the people who had obtained elementary level of education were aware of the disease, (commonly referred to as "bilharzia"), it is important to note that a detailed study about the common diseases could be incorporated into the school curriculum to empower the populace to acquire reliable information and get them involved in the design of applicable solutions in their respective communities.

Furthermore, the study revealed that schistosomiasis exists in the area since some of the respondents had previously been infected; however, the magnitude of the disease is not known since laboratory services are not available in the fishing village and inadvertently pose potentially huge health risks to the adjacent human populations. There is need for the Ministry of Health to establish well-equipped laboratories in the health centers located in these schistosomiasis endemic areas to enable the health workers carry out tests on patients showing schistosomiasis symptoms. There is also a need for the district health officers to continuously sensitize the local communities on health and safety in relation to schistosomiasis.

Some respondents noted that the praziquantel medicine distributed during the mass drug treatment is not friendly to some who would prefer injection while others would prefer tablets. The lack of alternatives renders the exercise fruitless thereby leaving some members who refuse to go for the exercise at risk of infection. There is a dire need for government to provide suitable alternatives that cater for the respective groupings of society.

The study also discovered that there are poor hygiene and sanitation practices predisposed the community to risk. For instance, findings showed that defecation, drinking lake water, swimming or bathing from the lake was significantly associated with having been infected with schistosomiasis. This poor hygiene only increases the risk. Upon such a foundation, there is dire need from the government and or local authorities to provide a cost-free disposal unit to prevent the poor disposal that would increase the risk of contamination of the lake that would inadvertently put many others at a risk of infection.

Suffice to note, is the need for Intensive health education. Despite the availability large- scale health education, these campaigns will serve no purpose if alternatives to current water contact practices are not available. Thus, the positive efforts ought to be directed towards the increase of the quantity of safe water

supplies in area to reduce on the possibility of contact with infested waters. This could be supported by the government agencies, private companies through Corporate Social Responsibility (CSR) programs as well as foreign donations. This shall enhance improved sanitation and hence pave way for a positive route towards a future program for effective elimination of the disease and or controlled spread.

### ACKNOWLEDGEMENTS

We thank all the interview participants who despite their busy schedules agreed to offer their time for discussions and answer the questionnaires. We are also grateful for the support from the Local government particularly the Local council leaders for mobilizing and organizing participants for FGDs. Finally, we appreciate the efforts of Mr. Hilary Wampamba and his team for contributing to the design, distribution of questionnaires, and data collection.

### Declarations

#### Availability of data and materials

All relevant data has been included in the manuscript.

### Funding

This research received financial support from the Ministry of Commerce of the People's Republic of China (2015400302209101), the Project of Public Health Department of Jiangsu Province (ZDRCA2016056). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

### Authors Contributions

K. Y. Sourcing for funding and project supervision; R. N. Conceptualization and study design, data collection and manuscript writing; J. H. and X. Y. Project administration and revision; T. O. and E. A. A. Curation of data, analysis, manuscript editing and Software. All authors read and approved the final manuscript.

### Ethics approval and consent to participate

Ethics approval and verbal clearance for the study was obtained from the Kasenyi Local government through the offices of the LC1 and LC3. This was mainly because the study did not involve taking samples from the participants but rather focused on knowledge and awareness of schistosomiasis. All study participants were 13 years above and verbal consent for participation was obtained from parents for participants aged 18 and below.

### Competing interests

The authors declare that they have no competing interests.

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## Appendix

### Abbreviations

- CSR:** Corporate Social Responsibility  
**NGO:** Non-governmental organizations  
**USAID:** US Agency for International Development  
**WHO:** World Health Organization  
**NTDs:** Neglected Tropical Diseases  
**SDG:** Sustainable Development Goals  
**CDC:** Center for Disease Control  
**LC:** Local Council  
**PSC:** Pre-school children  
**CBE:** Community based Education  
**OTT:** Over-Top Tax  
**TV:** Television  
**FGD:** Focus Group Discussions  
**HH:** Household  
**ATH:** African Traditional Healers  
**UPE:** Universal Primary Education  
**USE:** Universal Secondary Education

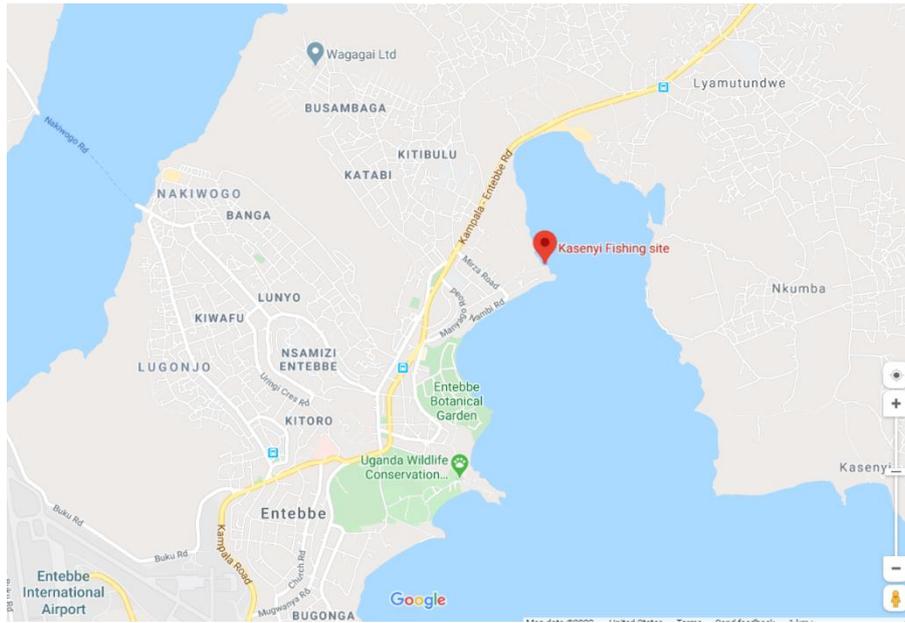


Figure S1. Map of Kasenyi Landing Site [21]. Source: Google maps screenshot, March, 2020

Table S1: Distribution of Participants' demographics

Variable	Frequency (n=225)	Percentage (%)
<b>Heard About Schistosomiasis</b>		
Yes	153	68%
Do not know	72	32%
<b>Previously Suffered from Schistosomiasis</b>		
Yes	126	56%
No	99	44%

Kun Yang. "The Role of Knowledge and Cultural Practices in Schistosomiasis Infection along Fishing Sites: A Case Study of Kasenyi Fishing Village, Uganda." *International Journal of Humanities and Social Science Invention (IJHSSI)*, vol. 09(5), 2020, pp 26-38.