SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

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UPTAKE OF PRAZIQUANTEL MASS-DRUG ADMINISTRATION FOR SCHISTOSOMIASIS CONTROL AMONG SCHOOL-AGE CHILDREN IN KPANDO MUNICIPALITY IN THE VOLTA REGION OF GHANA

BY

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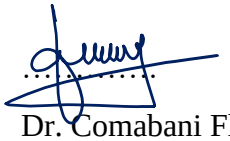
DECLARATION

I COMABANI FLORA ELODIE KOUDESSI, a student in the School of Public Health of the University of Ghana, declare that this research is my own work produced from research undertaken under supervision. Portions of works used from other researchers have been accordingly referenced. This research has not been presented anywhere else for the purpose of another degree.



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DEDICATION

This research is dedicated to my family and Pr. Nafissatou Oumar Toure.

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LIST OF ABBREVIATIONS

COVID-19	Coronavirus Disease 2019
GHS	Ghana Health Service
MDA	Mass-Drug Administration
MHD	Municipality Health Directorate
NTDs	Neglected Tropical Diseases
PC	Preventive Chemotherapy
PZQ	Praziquantel
S	Schistosoma
SAC	School-Age Children
SCH	Schistosomiasis
WHO	World Health Organization

DEFINITIONS OF TERMS

Preventive chemotherapy (PC): Utilisation of the anthelminthic drug(s) as a public health instrument against helminthiasis. It is the primary public health strategy recommended by the WHO to reduce morbidity and transmission of Schistosomiasis. Three key characteristics define a PC: population-based diagnosis and treatment, and implementation at regular periods (World Health Organization, 2006).

Mass-drug Administration (MDA): Distribution of medicines to the whole population of a given administrative setting (region, district, municipality, sub-municipality). Nevertheless, selection criteria may apply. The drugs can be administered in specific population groups. Some population groups can easily be reached at particular places like students in schools (school-based MDA) (World Health Organization, 2006). It is a large-scale PC.

Coverage: It is an indicator to evaluate large-scale PC interventions. The proportion of people in the target population who have received a single dose of Praziquantel during the last MDA.

Programme coverage: Proportion (%) of people who have received praziquantel during the last MDA as per programme target set.

National coverage: Proportion (%) of the population who has received Preventive Chemotherapy for Schistosomiasis control yearly in Ghana.

Geographical coverage: Proportion (%) of the implementation units or schools of endemic areas which have received Praziquantel.

Pre School-Age Children (PSAC): All children aged 1 to 4 years old and are not yet going to school (WHO, 2019).

School-age Children (SAC): All children aged 5 to 14 years old in and out of school (WHO, 2019).

Uptake: The proportion of people in the target population who have swallowed a single dose of Praziquantel during the last MDA.

Directly observed treatment (DOT): Administering a proper dose of the drug in the presence of a provider like a teacher in school-based interventions (World Health Organization, 2006).

ABSTRACT

Background: Schistosomiasis is one of the neglected tropical diseases of poverty. Ghana has a projected Schistosomiasis prevalence of 23.3 % across the region, with a clustered or localised prevalence of more than 50 % in spots like the Kpando Municipality. The lack of hygiene and play practices in contaminated water in school-age children (SAC) make them especially vulnerable to the disease. Since 2008, a single dose of Praziquantel is given to SAC yearly. The goal is to reach a Schistosomiasis prevalence of less than 1%.

Objectives: The purpose of this study was to assess the proportion of praziquantel mass-drug administration uptake among school-age children in selected communities of Kpando Municipality and to determine the factors associated with this uptake.

Methods: A cross-sectional study was performed among School-Age Children between 10 to 14 years in five selected communities from each sub-municipality of the Kpando Municipality. Questionnaires were administered to 462 respondents who were randomly sampled. Chi-square or Fisher's exact tests were used to test for associations between the various independent variables and the dependent variable. Logistic regression was performed to test associations with a p-value < 0.05.

Results: The coverage of the mass-drug administration reported by the municipality was 42.13% for SAC in and out of school. The uptake among 10 to 14 years SAC during the study was 90.07%. The factors related to the uptake of Praziquantel were school attendance and level of education. Also, awareness of SAC on the MDA had a relationship with uptake. Children who knew that SAC was the target population of the MDA had 3.14 (AOR=3.14, 95%CI: 1.57-6.30, p-value=0.001) times odds of swallowing Praziquantel compared with children who did not know that SAC was the target population of the MDA. Those who understood the prevention purpose of the MDA were 7.70 times more likely to take Praziquantel (AOR=7.70,

95%CI:3.16-18.77, p-value<0.001). Also, those who identified the importance of the MDA are 8.06 times more likely to take Praziquantel compared to those who did not identify the importance of the MDA(AOR=8.06, 95%CI:1.78- 36.55, p-value=0.007). Those who were willing to take Praziquantel at the next MDA had more than fourfold increased odds of taking the drug (AOR=4.59, 95%CI:1.19-17.67, p-value=0.027).

Conclusion: The uptake of Praziquantel MDA in selected communities of the Kpando Municipality among 10 to 14 years SAC was 90.07%. Some of the factors associated with this uptake were the level of education, school attendance, awareness of the MDA, parent support, and willingness to participate at the next MDA. Future interventions should consider a combined community-based MDA.

CHAPTER ONE

INTRODUCTION

1.1 Background

Schistosomiasis is among the neglected tropical diseases (NTDs), of poverty (Elmorshedy et al., 2020). It is caused by an infection with the trematode parasite of the genus Schistosoma (Colley, Bustinduy, Secor, & King, 2014). Among the three species that commonly infect humans, two species (*S. haematobium*, *S. mansoni*) are found in Ghana. *Schistosoma haematobium* is the most predominant, followed by *S. mansoni* (Lai et al., 2015). The disease affects almost 250 million people worldwide (Hotez et al., 2014), and 732 million people living in endemic areas are at risk. At least 90% of Schistosomiasis is found in sub-Saharan Africa, where more than 200,000 deaths are annually attributed to the disease (World Health Organization, 2020). Ghana has a projected country-wide prevalence of 23.3%, with focal or localised; prevalence levels of about 50% (Hotez et al., 2014). As a result, the endemicity varies from low to high by District or Municipality. For instance, in Kpando Municipality, a high endemicity is registered (≥50%) (Global Atlas of Helminth Infections, 2018).

The lack of hygiene and play habits of School-Age Children (SAC) in contaminated water make them particularly vulnerable to helminth infestation (Khonde Kumbu, Mbanzulu Makola, & Bin, 2016). Thus, if left untreated, children are exposed to retarded growth and impaired cognitive function (Muhumuza, Olsen, Katahoire, & Nuwaha, 2013). The most effective intervention to eliminate this disease is chemoprophylaxis by Praziquantel (PZQ). This intervention is done by mass drug administration (MDA) to the vulnerable population (Stothard, Sousa-Figueiredo, & Navaratnam, 2013; Tchuem Tchuenté, Rollinson, Stothard, & Molyneux, 2017). As per WHO guidelines, it should be distributed once every year when the prevalence is about 50% and every two years when it is about 10% and less than 50% (WHO strategic plan., 2013). Complying with these recommendations, Ghana is performing the

intervention yearly or every other year or once every three years since 2008 in schools (among 5 to 14 years old) by the National Tropical Diseases Control Office (Campbell et al., 2018; GHS, 2016). The Volta Region is one of the most affected regions by the disease. The coverage recommended by WHO and Ghana Health Service for the praziquantel preventive chemotherapy to be useful is at least 75% (Anderson, Turner, Farrell, Yang, & Truscott, 2015; GHS, 2016; WHO, 2001). This target is locally achieved in Ghana (Cunningham et al., 2020), but still less than expected in specific areas. This leads to the continued existence of the disease in the country. Thus, the disease is not yet eliminated as projected. Even though some studies are recommending that the MDA must also include PSAC and adults to be more efficient for the elimination of the reservoir of the disease (WHO, 2010), the ongoing intervention among SAC must be done appropriately. Therefore, the assessment of the uptake of praziquantel Preventive Chemotherapy (PC) is imperative.

1.2 Problem statement

In 2001, the World Health Assembly approved preventive chemotherapy through regular MDA of Praziquantel to SAC as the crucial strategy for the prevention of Schistosomiasis (WHO, 2001). This MDA intervention has to be combined with health education, water sanitation, and hygienic improvements (WHO, 2001, 2012). To meet this goal of interrupting transmission, as set out in the 2012–2020 WHO Strategic Plan, the prevalence of heavy-intensity infections in all schistosomiasis-endemic countries should be reduced by 2020 to less than 5% and by 2025 to less than 1% (Tchuem Tchuenté et al., 2017). In 2016, WHO had set a goal for the elimination of Schistosomiasis in the African Region by 2020, and in the World by 2025 (Savioli, 2012).

In Ghana, praziquantel mass-drug administration targeting SAC begun in 2008. The main objective of the national Schistosomiasis control programme is to reduce Schistosomiasis

prevalence by less than 1% by 2020. To achieve this goal, it is necessary to treat at least 75% of SAC and high-risk populations in endemic areas. Also, the need to increase awareness on prevention and Schistosomiasis control has been included as an objective for the programme goal (GHS, 2016). The proportion of SAC who have been treated with Praziquantel is one of the key indicators of Schistosomiasis control in the country (GHS, 2016). After multiple rounds of mass drug administration, schistosomiasis is still endemic in Ghana with an average national prevalence of 23.3 % (Kulinkina et al., 2018; Lai et al., 2015). The endemic areas are situated along the Volta River and the Volta lake. Thus, in the Kpando Municipality, the prevalence is more than 50% (Global Atlas of Helminth Infections, 2018) even though Praziquantel is distributed every year. According to Muhumuza et al. (2013), awareness of praziquantel side effects, lack of knowledge about transmission and prevention of schistosomiasis, and lack of support from teachers are some of the significant factors associated with low uptake.

An effective mass-drug administration is crucial in eliminating schistosomiasis by 2025 (Tchuem Tchuenté et al., 2017). A total of one hundred and seventy districts were included as endemic, and a school-based praziquantel PC is implemented in these areas (GHS, 2016). As a result, Kpando Municipality benefits from this PC every year. It is therefore essential to assess the uptake and the factors associated with praziquantel preventive chemotherapy in communities in Kpando Municipality, which have been benefiting from the mass drug administration programme, in order to determine areas of the intervention that need improvement for the control or elimination of Schistosomiasis.

1.3 Conceptual framework

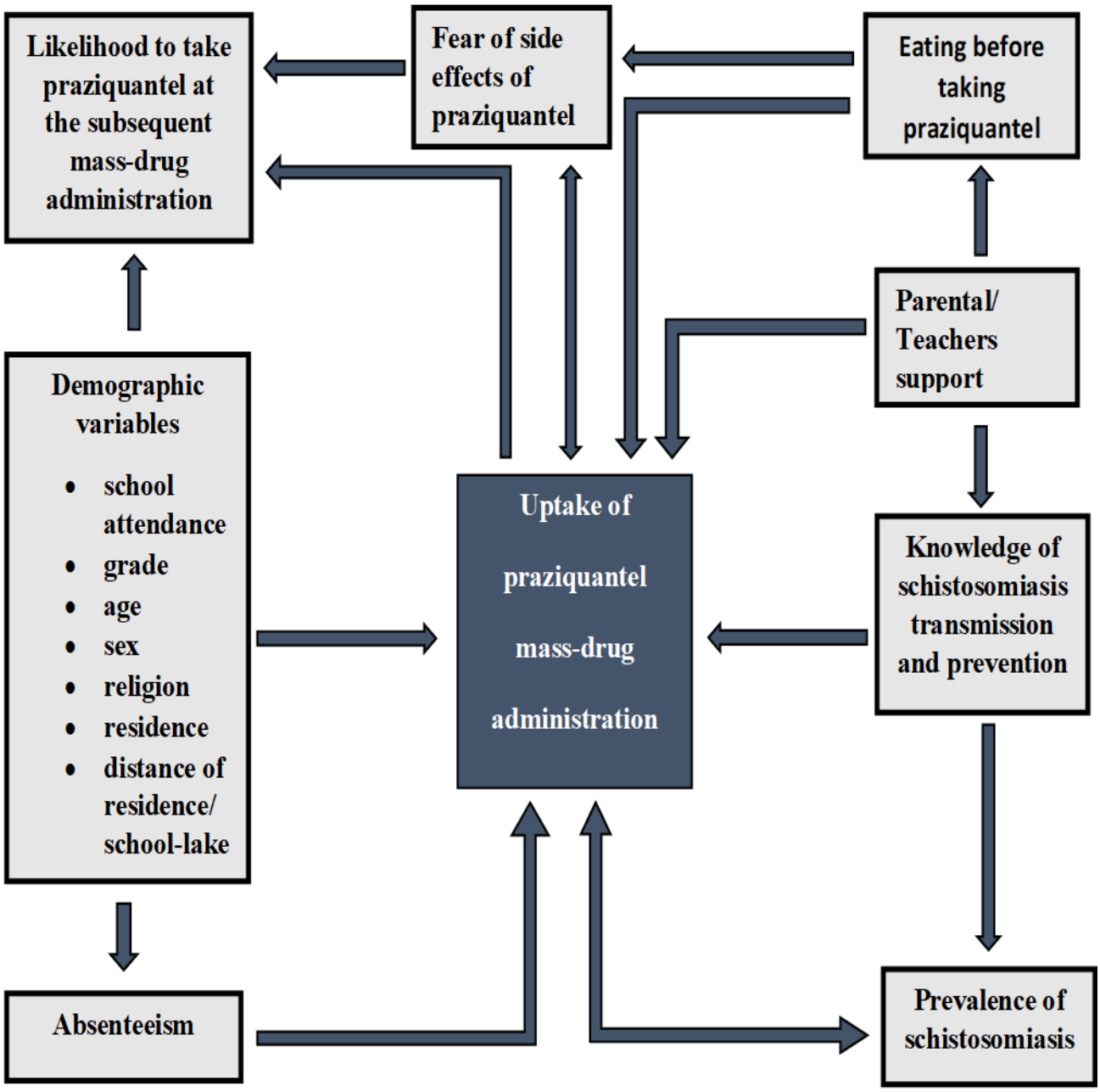

Figure 1: Conceptual framework of the uptake of Praziquantel MDA and associated factors

The conceptual framework of the study was adapted from the Health Belief Model (HBM). This model explains and gives a better understanding of the determinants of health or factors influencing the utilisation of a health intervention (Norman & Conner, 2016). The HBM uses

two central individual representations of health behaviour: the views on disease or health threats such as the risk of its occurrence and its consequences, and the evaluation of behaviours to prevent it (Norman & Conner, 2016). These two assumptions define the outcome for a person after a health-related act, even though their effect is altered by individual non-modifiable and modifiable factors in sociodemographic variables and personality (Conner, M., & Norman, 2006). The study assesses the factors or variables interacting with the uptake of Praziquantel MDA. This assessment can help to reduce the prevalence of schistosomiasis infection; also, the prevalence may affect the uptake. An increased prevalence may encourage people to adhere to MDA. Sociodemographic factors such as age, sex, religion, ethnicity, grade, place of residence, the distance of school/residence tend to affect the uptake of Praziquantel (Muhumuza et al., 2013). Lack of knowledge on schistosomiasis transmission, symptoms, and prevention can also influence the uptake (Muhumuza et al., 2013). The factors associated with non-uptake can be the fear of side effects, lack of support from parents and teachers, absenteeism and not eating before distributing Praziquantel (Burnim, Ivy, & King, 2017). The likelihood of taking Praziquantel at subsequent mass-drug administration can be determined by the uptake at the last mass-drug administration (Burnim et al., 2017). All these different determinants influence praziquantel uptake, as illustrated in the figure above **(Figure 1).**

1.4 Justification

The praziquantel mass-drug administration is the most effective intervention to eliminate schistosomiasis. There is a need to assess the uptake of this intervention. The new goal must be met by 2025. School-age children are the most vulnerable. Among them, children aged 10 to 14 years old are more likely to have the disease (Anyan et al., 2019; Mewabo et al., 2017). Along the Volta river, which encompasses the Kpando Municipality, Schistosomiasis is still endemic (Hotez, Biritwum, Fenwick, Molyneux, & Sachs, 2019). This study attempts to

identify evidence-based knowledge about the uptake of Praziquantel mass-drug administration and its associated factors. A better understanding of the factors will help to improve Praziquantel mass-drug administration uptake.

1.5 Objectives

1.5.1 General Objective

The general objective of the study was to assess the uptake of Praziquantel MDA for Schistosomiasis control among SAC in selected communities in the Kpando Municipality in the Volta Region.

1.5.2 Specific Objectives

1. To assess the proportion of praziquantel mass-drug administration uptake among children aged 10 to 14 in selected communities in the Kpando Municipality.
2. To determine the factors associated with praziquantel mass-drug administration uptake among children aged 10 to 14 in the selected communities in the Municipality.

CHAPTER TWO

LITERATURE REVIEW

2.1 Life cycle of Schistosome

Schistosomiasis or bilharziasis, also known as snail fever, is an infectious disease caused by water-borne, parasitic trematodes of *Schistosoma* species (Anderson et al., 2015; Turner et al., 2017; Zhang, Harvim, Georgescu, & Richard, 2017). The most prevalent species in Ghana (sub-Saharan Africa) are *Schistosoma haematobium* (76.2%) and *Schistosoma mansoni* (6.3%) (GHS, 2016; Lai et al., 2015). The transmission of schistosomiasis happens when infected people contaminate fresh-water sources with faecal matter (for *S mansoni*) or urine (for *S haematobium*) containing schistosome eggs. The excreted eggs flap in the water, discharging miracidia, which infects specific snail species: Bulinus for *S haematobium* and Biomphalaria for *S mansoni* (Gryseels, Polman, Clerinx, & Kestens, 2006). In the snail, the miracidia develop into sporocysts that undergo asexual replication to produce cercariae (the infective larval form), which are released into the water. Humans are infected when they encounter water sources containing infectious cercariae (Gryseels et al., 2006). As soon as they enter the skin, the cercariae lose their tail and become *schistosomula*, which are transported through the blood or lymphatic vessels to the heart and lungs, temporarily settling in the blood vessels of the liver, where they mature into adult worms (Gryseels et al., 2006). Then the adult worms migrate to the blood vessels around the bladder (*S haematobium*) or the intestines (*S mansoni*). Four to nine weeks post-infection, the female worms begin to lay eggs (Gryseels et al., 2006). Figure 2 below illustrates the life cycle of the parasite.

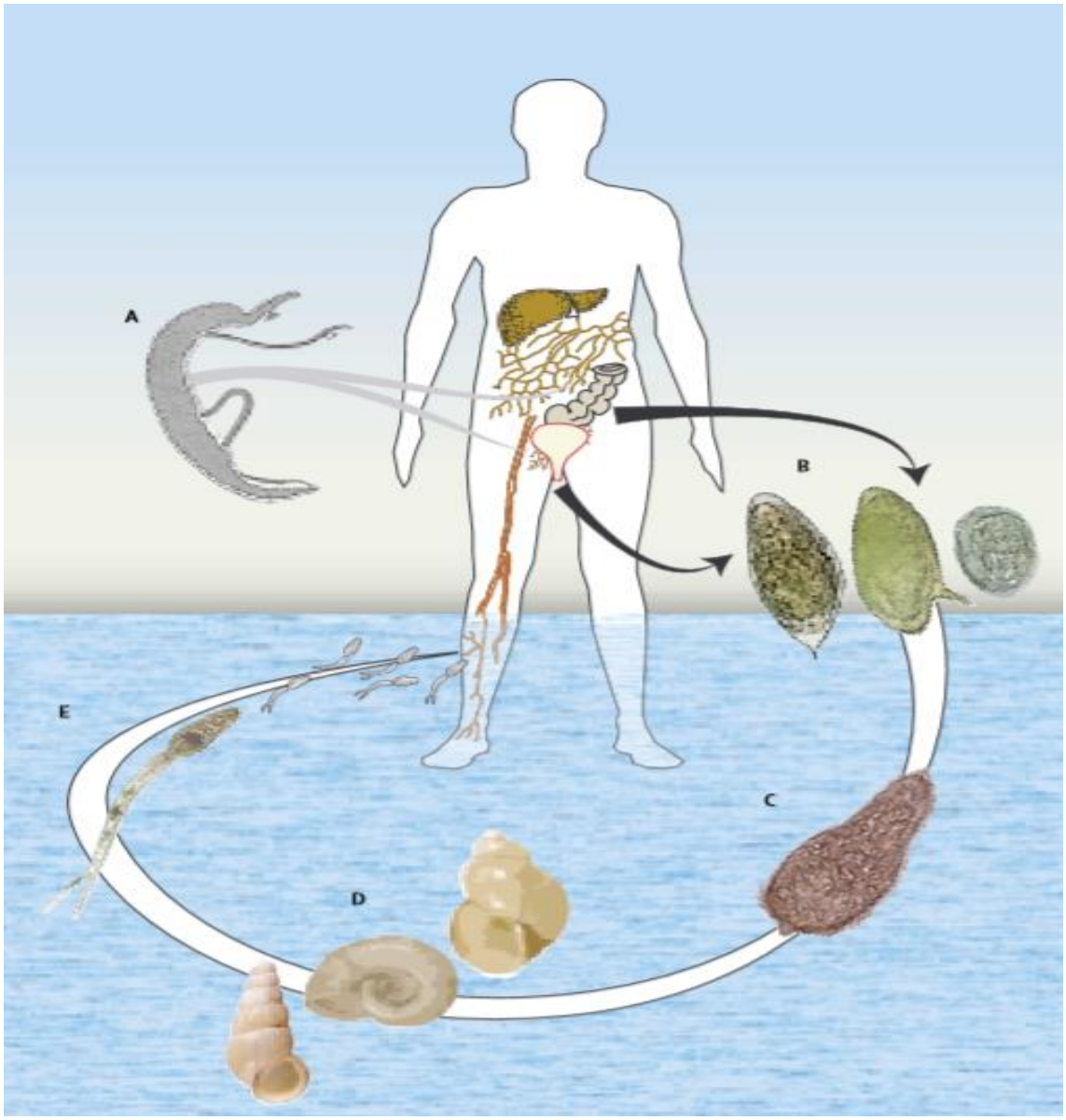

Figure 2: Transmission cycle of Schistosomiasis

A: paired adult worms (sturdy male holding slender female). B: eggs (left to right, S haematobium, S mansoni, S japonicum). C: ciliated miracidium. D: intermediate host snails (left to right, Oncomelania, Biomphalaria, Bulinus). E: cercariae (Gryseels et al., 2006).

2.2 Schistosomiasis infection

The signs and symptoms do not result from the worms themselves but the immunologic reactions to Schistosoma eggs trapped in tissues, although many infections are asymptomatic (Doowuese et al., 2019). The intensity of the symptoms and signs is linked to the number and location of eggs trapped in the tissues (Doowuese et al., 2019). The location of the infection can be either the genitourinary tract or the intestines and liver (Colley et al., 2014). The infection evolves in three different phases: acute, chronic, and advanced disease (Gray, Ross, Li, & McManus, 2011). Acute schistosomiasis also called Katayama fever, is a systemic hypersensitivity reaction that may occur weeks after the initial infection (Doowuese et al., 2019). It starts following skin penetration by cercariae. Thus, a local cutaneous hypersensitivity reaction arises and looks like small and itchy maculopapular lesions. Its symptoms are fever, myalgia, fatigue, non-productive cough, diarrhoea, dysuria, haematuria (*S haematobium*), and abdominal pain. The chronic and advanced phase is characterised by bladder calcification, ureteric obstruction, a secondary bacterial infection in the urinary tract, renal colic and hydronephrosis, (Gray et al., 2011). Other sequelae of chronic Schistosoma infection include anaemia, malnutrition, growth retardation, poor school performance, infertility, and potentially lethal complications such as portal hypertension, renal failure, and bladder cancer (Colley et al., 2014).

The diagnosis of genitourinary Schistosomiasis is confirmed by microscopy in a urine sample concentrated by sedimentation, centrifugation, or filtration and forced over a paper, nylon, or nitrocellulose filter. Also, self-reported blood in the urine and microhematuria on chemical reagent strips shows potential infection in endemic areas. Also, the Kato-Katz thick smear stool examination detects eggs of intestinal Schistosomiasis in faecal specimens (Gray et al., 2011).

Serological and immunological tests may also be useful in non-endemic or low transmission areas (Gray et al., 2011).

2.3 Schistosomiasis prevention and control

The main goal for Schistosomiasis control in Ghana is to reduce schistosomiasis related morbidity to levels of no public health significance (<1%). For the achievement of this goal, at least 75% of school-age children must be treated, same as all high-risk populations in endemic areas. Also, there is a need to increase awareness of prevention and control of Schistosomiasis (GHS, 2016; WHO, 2012).

Strategies for morbidity control are large-scale drug treatment also called preventive chemotherapy of infected and vulnerable populations with Praziquantel (PZQ), health promotion and education, improved access to safe water and sanitation, associated to vector control (GHS, 2016; Zhang et al., 2017). The indicators of an effective Schistosomiasis control programme are reflected by the proportion of school-age children treated, morbidity, haematuria, the prevalence of Schistosomiasis and improvement in WASH indicators (GHS, 2016).

2.3.1 Large-scale drug administration

Large-scale drug administration targets populations at risk such as school-age children, adults from specific groups (pregnant and breastfeeding women; people with occupations involving contact with infested water, such as fishermen, farmers, or women in their domestic chores), and all communities that are living in endemic areas (J Russell Stothard & Montresor, 2014). For this large-scale drug distribution, praziquantel (PZQ) 600 mg is used. The dose is based on the weight (PZQ 40 mg/kg) or height, using a praziquantel tablet pole (School Health Integrated Programming, 2018). Recent studies have demonstrated the benefit for pre-school age children

when Praziquantel is made palatable (School Health Integrated Programming, 2018). Even though there are controversies towards preschool-age children inclusion, however, they are not included because of the unavailability of pediatric formulations of Praziquantel (WHO, 2019). Praziquantel is the recommended preventive chemotherapy. The baseline prevalence among school-age children determines the frequency of mass-drug administration. Thus, in high-risk communities (prevalence ≥50% by parasitological methods; or ≥30% by questionnaire for a history of haematuria), the intervention is recommended every year for all school-age children. For moderate-risk communities (prevalence ≥10% but <50% by parasitological methods; or <30% by questionnaire for a history of haematuria), the intervention is recommended every two years for all school-age children. Low-risk communities (prevalence <10%), children should be treated at least twice during primary school age (J Russell Stothard & Montresor, 2014). The mass-drug administration is done following different steps before, during and after the intervention. It is done in combination with albendazole preventive treatment for soil-transmitted helminths. As said above, it is done periodically on at-risk populations and aimed to treat mild symptoms, prevent new cases occurrence and also infected people from developing severe, late-stage chronic disease (Doowuese et al., 2019). Thus, before the intervention, a social mobilisation should be carried out by region and district. Parent's information sheets should be given to children to send to their parents to inform them of the exercise. Out of school, SAC should be encouraged to visit schools to take the drug. At the district and school-level, training should be held, and logistics distributed to all schools. Markings of height for the standard praziquantel treatment measurement should be made on the walls of classrooms (World Health Organization, 2011). The day of the mass drug administration, it is recommended that children should eat before taking the drug. The class teachers are expected to give the drugs to their pupils. The medicine is given during directly observed treatment (DOT). Most of the children are schooling, but it is recommended to

encourage non-enrolled school-age children to come to school for the intervention. For an optimum uptake, the children must eat before taking the drug (Muhumuza, Olsen, Katahoire, Kiragga, & Nuwaha, 2014). Also, teachers should fill all the appropriate forms. The occurred side effects should be managed appropriately, using the recommendations provided in the Cue Card. After treatment, it is expected that all forms should be filled at the appropriate levels and submitted to the appropriate levels. Reports should get to the district level by the deadline given. All leftover drugs should be retrieved by circuit supervisors and sent to the District level then to the Regional Medical Stores for storage. Effectiveness of the intervention is measured with the help of these indicators as followed: the proportion of school-age children treated, and self-reported hematuria (GHS, 2016).

2.3.2 Health promotion and education

Heath education is also part of the strategies for schistosomiasis prevention. It aims to improve underlying knowledge, awareness, and practices for Schistosomiasis control. It can be done in a community setting, health facilities or schools. It can be delivered in combination with praziquantel preventive chemotherapy or isolated (Price, Verma, & Welfare, 2015). It is delivered by trained teachers or trained community health workers, to school-age children and other residents of the communities. Moreover, there is evidence that health education performed by local teachers or community members had better outcomes compared to others.

Different material may be used such as film, posters and school information booklets (Price et al., 2015).

2.3.3 Water, sanitation, Hygiene

It is proven that improvements in water, sanitation, Hygiene (WASH) should diminish schistosomiasis transmission, even if their impacts are highly dependent on the social and environmental setting. It is mostly due to behavioural, biological, cultural, demographic,

ecological, environmental and socioeconomic factors (Grimes et al., 2014). According to a meta-analysis of observational studies, safe water supplies and adequate sanitation were associated with significantly with a lower likelihood of Schistosoma infection. This meta-analysis confirmed the necessity of more consideration to environmental factors and living conditions in schistosomiasis control and enhanced the growing evidence about the relationship between WASH and NTDs like Schistosomiasis (Grimes et al., 2014).

Reductions in contamination of freshwater with miracidia and human exposure to cercaria-infested water can only impact schistosome transmission if the part in question is, or becomes, the limiting factor. It is well known that schistosomiasis transmission happens focally, in freshwater bodies that are contaminated with human faeces or urine, that are colonised by specific intermediate host snails and where human water contact occurs. However, schistosomiasis control is presently focused on adult worms in the human body through periodic preventive chemotherapy. At the same time, only token attention is given to ecology, which involves complicated interactions between behaviours, parasites and intermediate host snails (J. E. Grimes et al., 2015).

2.3.4 Vector control

The intermediate hosts in the life cycle of schistosomes are snails. Snail control, mostly by chemicals or plant extracts molluscicides was for many years the basis of schistosomiasis control. For example, Niclosamide is specially developed for the control of freshwater snails such as liver flukes but is toxic for fishes (World Health Organization(WHO), 2017).

2.4 Prevalence of praziquantel uptake during mass-drug administration

In Uganda, Muhumuza et al. (2013) found a low coverage of 28.2% in an observational study among school-age children of 10 to 14 years after a school-based mass-drug administration.

The coverage of a community-based treatment was also low at 44.17% (Chami et al., 2016). Similarly, a self-reported coverage of 48.8% was registered among ≥five years of age in another Ugandan study (Adriko et al., 2018). An Ivoirian coast study concluded for coverage of 47.6% after a community-based mass-drug distribution (Coulibaly et al., 2018). In another study in Zanzibar on Praziquantel school-based treatment, coverage of 85.2 % was registered in Pemba and 86.9 % in Unguja (Knopp et al., 2016).

The combination of both community and school-based treatment showed that more than 75% of the populations at risk were reached. Thus, a coverage of 89% was reported in a Mali-based study. In this study, village chiefs, community health workers, and community drug distributors (CDDs) chose the best distribution strategies for each village. However, it involved community and school-based interventions (Massitan Dembele et al., 2012). Other studies showed the effectiveness of combined school and community-based interventions. In Burkina Faso, the combined approach resulted in 88% coverage for non-enrolled SAC and to 96% for enrolled SAC (Burnim et al., 2017; Gabrielli et al., 2006). Also, in Sierra Leone, 86% overall SAC coverage was registered for a similar approach (Burnim et al., 2017; Sesay et al., 2014). Furthermore, Oshish et al. (2011), in a Yemenite study, found coverage of 95% among school-age children after implementing a combined approach. Thus, it appears that combining a community-based with school-based preventive chemotherapy gives a better outcome.

2.5 Factors influencing praziquantel uptake

Many factors influence the uptake of Praziquantel for schistosomiasis prevention. These include socio-demographic factors such as age, gender, religion, and socioeconomic status (Burnim et al., 2017; Chami et al., 2016; Muhumuza et al., 2013). Other factors had also been reported, such as fear of side effects, absenteeism. Factors related to children, parents and the

distributors also influenced the uptake of Praziquantel (Burnim et al., 2017; Chami et al., 2016; Muhumuza et al., 2013). The uptake is also related to the knowledge of the children about the prevention and the treatment of the disease (Burnim et al., 2017; Martel et al., 2019; Muhumuza et al., 2013).

2.5.1 Socio-demographic factors

Muhumuza et al. (2013) study on uptake of Praziquantel found a mean age of 11.6 years (S.D 1.8) in children aged 10 to 14 years old in 12 primary schools. Their findings indicated a higher female attendance rate of around 55%. No significant difference in coverage between males and females was observed in other research (Burnim et al., 2017; Chami et al., 2016). According to Chami et al. (2016), a Muslim household was correlated with a 52% lower probability of obtaining Praziquantel than a Christian household. In the same report, the majority tribes, Mudama or Musoga members are 2.11 times more likely to receive Praziquantel ($p= 0.02$) than minority tribe members (Burnim et al., 2017; Chami et al., 2016). Also, there was a significant difference between majority ethnic groups such as Soninke and Bambara, and minority groups such as Fulani and Moorish in Mali ($p < 0.01$) (Dabo, Bary, Kouriba, Sankaré, & Doumbo, 2013). Additionally, migrants had a much higher rate of absenteeism during mass-drug distribution in the same study.

Other factors, such as school attendance, influenced uptake, especially in school-based interventions. It is confirmed by the school-based studies cited above.

2.5.2 Factors related to Praziquantel

The participants or community drug distributors or teachers indicated in many studies that fear of side effects had a significant impact on MDA uptake (Anto, 2013; Burnim et al., 2017;

Muhumuza et al., 2014, 2013; Muhumuza, Olsen, Nuwaha, & Katahoire, 2015). Thus, in a Ugandan study where MDA uptake was 28%, seventy-two per cent of children who refused praziquantel uptake reported fear of side effects as a reason (Muhumuza et al., 2013). Also, in a Ghanaian integrated program, 18% of participants who took ivermectin and albendazole declined Praziquantel, because of its side effects (Anto et al., 2011).

It was also reported in another study that some negative beliefs like fear of the side effects and the poor taste of Praziquantel correlated with uptake (OR 2.72, 95% CI 1.86–3.96 and OR 7.37, 95 % CI 4.95–10.98 respectively) (Tuhebwe et al., 2015).

Side effects were usually stomach aches, nausea, diarrhoea, headaches, and dizziness (Burnim et al., 2017). Thus, to prevent these side effects, studies demonstrated that it is better to take Praziquantel after a meal or snack (Burnim et al., 2017). For instance, a randomised, school-based study conducted by Muhumuza et al. (2014) observed that taking snacks with Praziquantel resulted in substantially greater MDA uptake (94%) in snack-schools compared to 79% in non-snack schools ($p = 0.002$).

2.5.3 Factors related to the knowledge on prevention and transmission of Schistosomiasis

Knowledge of the transmission and prevention of Schistosomiasis is one of the most important variables associated with uptake (Muhumuza et al., 2013). According to a quantitative study, although children who took part in the study were increasingly aware of Schistosomiasis, their biomedical knowledge and understanding of transmission and prevention were indeed very minimal (Muhumuza, Olsen, Nuwaha, et al., 2015).

Tuhebwe and colleagues showed in a Ugandan-based study that uptake of Praziquantel was more likely if the respondent was aware of the transmission and prevention of Schistosomiasis (adjusted odds ratio [AOR] 1.85, 95 % CI 1.22-2.81) and they had obtained health education from health professionals.

2.5.4 Factors related to drug distributors

Teachers are trained to distribute Praziquantel to school-age children during school-based mass-drug administration. Community health workers or community members are also involved as drug distributors sometimes (Burnim et al., 2017). Diverse factors related to them influenced the uptake. As such, an increase in the distributor-to-recipient ratio reduces workload. Also, providing material or financial incentives to drug distributors improve the proportion of uptake (Burnim et al., 2017; Muhumuza, Olsen, Nuwaha, et al., 2015). The MDA should not be scheduled concomitantly with other health programmes that provide incentives or during times of the year with demands such as school examinations, high agricultural activities or other activities (Burnim et al., 2017). Also, the level of education of the drug distributors influences their performance during drug distribution (Chatio, Welaga, Tabong, & Akweongo, 2019).

CHAPTER THREE

METHODS

3.1 Study Design

This study was quantitative cross-sectional and was conducted in selected communities of Kpando Municipality from the end of July to mid-August 2020. It helps to collect the data at a specific point in time. The variables of interest were quantifiable and statistically analysed. The objective was to determine in the Kpando Municipality which factors could improve the implementation of Praziquantel MDA. Thus, the impact of specific factors influencing MDA implementation was measured among a representative subset of the population. The findings were generalized to the population. Participants were school-age children from 10 to 14 years who assented, and parents or guardians consented to the study. The households of the communities were visited, and the questionnaires were administered to participants by trained data collectors.

3.2 Study Area

The Kpando Municipality is one of the eighteen (18) municipalities and districts of the Volta Region of Ghana. It occupies a land area of approximately eight hundred and twenty square kilometres. It is organised into five (5) sub-municipalities as followed: Agbenoxoe, Kpando, Torkor, Gbefi-Gadza, and Sovie-Kudzra. These sub-municipalities cover sixty (60) communities.

The Volta Lake stretches over 80km of the coastal line and demarcates the western boundary of the municipality. Based on the 2010 population census, the population of the Municipality was estimated at 53,736, distributed within 52,754 households. Among this population, 6,466 are children and live in 13 villages (Ghana Statistical Service, 2014). Children aged 10 to 14

represent 12% of the population. Children represent 37.5% of the total household population, which represents approximately two children per household (Ghana Statistical Service, 2014) According to the Kpando Municipality Health Directorate 2014 annual report, the population of the municipality is approximately 66,648, which is made of 19,298 households and 7,865 children aged 10 to 14 years old (Kpando Municipality Health Directorate & Population, 2015). For the study, one community was selected randomly in each sub-municipality by a simple random sampling method. Thus, in every sub-municipality, all communities were numbered, and a random number generator used to select Dafor-Tornu, Abanu, Tsitekorfe, Kudzra Newtown, and Gadza. These areas have a high endemicity in schistosomiasis (Global Atlas of Helminth Infections, 2018).

The last praziquantel mass drug administration conducted in Kpando Municipality was in November 2019, targeting 74 schools (Kpando MHD MDA Data, 2019). Eligible SAC received a single dose of Praziquantel, depending on their height.

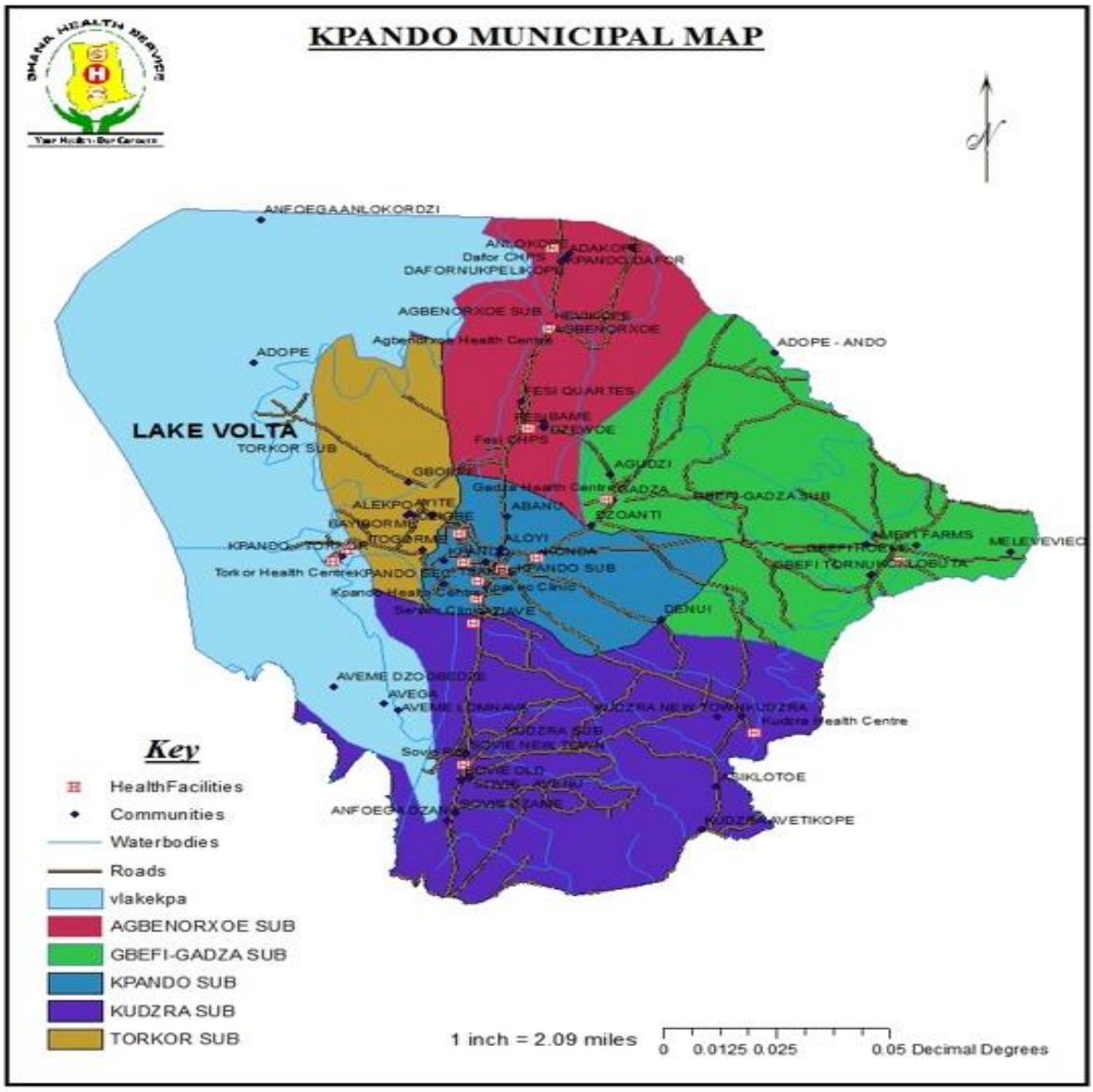

Figure 3: Kpando Municipality Map (Kpando Municipal Health Directorate, 2020)

3.3 Variables

The uptake was the dependent variable and was defined as none or one utilisation or swallowing Praziquantel during the last mass-drug administration. Age was graded at an interval of 2 years, from ten years to fourteen years. Gender was male or female, and educational level was represented as the grade in school or "no formal education" The religion

of the child was defined as one among Christian, Muslim, traditional, or other to be precise. The child answered the place of residence by saying the place of residence of the parents or guardians. The ethnicity of the child was defined as one among the choices in the questionnaire. The distance from school to the lake or from home to the lake by foot was in kilometres after estimating the distance from an area to another. Multiple choices were used to evaluate knowledge on the disease transmission, signs, symptoms, prevention measures, and the MDA intervention **(Tables 1a, 1b).**

Table 1 a: Variables

No	Variable name	Operational definition	Type of variable	Scale of measurement
1	**Uptake of Praziquantel**	defined as having received and swallowed the drug at last MDA	dependent	nominal
2	**Age**	Age of the child in years	independent	continuous
3	**Sex**	Gender of the child	independent	categorical
4	**Grade**	Grade of the child	independent	categorical
5	**Religion**	The religion of the child	independent	categorical
6	**Ethnicity**	The ethnicity of the child	independent	categorical
7	**place of residence**	Where the child lives	independent	nominal
8	**distance school from the lake**	Distance between the school and the lake	independent	continuous
9	**distance residence from the lake**	Distance between home and the lake	independent	continuous
10	**Knowledge of schistosomiasis transmission**	Basic knowledge of the child about schistosomiasis transmission	independent	categorical

Table 1 b: Variables

No	Variable name	Operational definition	Type of variable	Scale of measurement
11	**Knowledge of schistosomiasis signs and symptoms**	knowledge of the child about schistosomiasis symptoms	independent	categorical
12	**Knowledge of behaviour for schistosomiasis prevention**	knowledge of the child about schistosomiasis prevention	independent	categorical
13	**Knowledge of preventive praziquantel treatment**	knowledge of the child about preventive praziquantel MDA	independent	categorical
14	**Utilisation of Praziquantel at the last MDA**	If the child has taken Praziquantel at the last MDA	independent	categorical
15	**Experiences from the uptake of Praziquantel in recent MDA among children**	Consequences related to praziquantel utilisation	independent	categorical
16	**Reasons for not taking Praziquantel**	Justification of non-uptake	independent	categorical

3.4 Sampling

3.4.1 Study population

The study was conducted from the end of July to mid-August 2020. The municipality is made of five sub-municipalities, and each of them has different communities. Thus, Kpando Municipality is comprised of Kpando sub-municipality (11 communities), Agbenorxoe sub-municipality (11 communities), Torkor sub-municipality (21 communities), Sovie-Kudzra sub-municipality (9 communities) and Gbefi-Gadza sub-municipality (8 communities).

One community was selected randomly from each sub-municipality within the Municipality. In every sub-municipality, all the communities were numbered, and a random number generator was used for the selection. At the community level, households were selected by systematic random sampling. At the household level, children aged 10 to 14 living in the five selected communities (Abanu, Dafor Tornu, Tsitekorfe, Kudzra Newtown, Gadza) were involved.

3.4.2 Inclusion criteria

All children aged 10 to 14 years who were living in selected communities of the Kpando Municipality for at least one year were included in the study. Eligible children also had to give their assent and seek consent from one of their parents or guardians before participating in the study.

3.4.3 Exclusion criteria

No more than two children with inclusion criteria were included in the same household.

3.4.4 Sampling procedure

A multi-stage sampling procedure was used. Kpando Municipality has five sub-municipalities, and these sub-municipalities served as strata. In every sub-municipality, all communities were numbered. One community was selected randomly from each sub-municipality using a simple random sampling technique. The following communities were selected: Abanu (Kpando sub-municipality), Dafor-Tornu (Agbenorxoe), Tsitekorfe (Torkor), Kudzra Newtown (Sovie Kudzra) and Gadza (Gbefi-Gadza). After these five communities had been selected, the sample size was distributed proportionately per the population of the community. In the selected communities, households were also randomly selected by systematic random sampling. The first household was selected randomly within a sample interval. This sample interval "k" was determined by the number of households in the total population (2017 households) divided by the number of households needed for the sample. By assumption, the households needed for the sample is equal to the sample size. k= 2017/415= 4.86. Then, a random number (2) between 1 and the sampling interval five (5) was selected. The consecutive households were selected using the sampling interval 5. In each household, one to two participants were selected. Households were visited door-to-door after previous notice. At the household level, the data collectors included purposefully children aged 10 to 14 present at home the day of the interview. The household was revisited at least once in case of the absence of a parent/guardian and or respondent.

The 10 to 14 years old age interval was chosen because children in this age interval are more likely to have Schistosomiasis because of play habits. Also, for the study, they had a better understanding of the study objectives.

Assent was sought from all participants and consent from their guardians or parents. Those who declined to participate were excluded from the study without any form of intimidation.

The Kpando Municipality Health Directorate data on Praziquantel MDA among school-aged children indicated coverage of 86.26% after the 2019 annual MDA.

3.4.5 Sample Size Calculation

According to WHO, in 2016, the coverage of praziquantel mass-drug administration was 57.2% in the African Region (WHO, 2018). Therefore, an uptake of 57.2 % for Praziquantel mass-drug administration was used. The sample size for the analysis was determined using the equation of Cochran.

$$\mathbf{n= \frac{Z^2\, p(1-p)}{d^2}}$$

Where n = sample size, Z= is the normal standard deviation at the appropriate confidence interval set at 95% (1.96), p= is the approximate proportion of the target population expected to have the measured characteristics, d= the level of precision set as 5%

$$\mathbf{n= \frac{1.96^2\ (0.572)(1-0.572)}{0.05^2} = 377}$$

After adding 10% non-response effect n=377+(377x0.1) = 415

However, the total number of 462 school-age children were recruited because 415 is the minimum expected sample size to power the study. The proportionate number of respondents per community was calculated depending on the size of the target population (Tables 2 and 3).

Using the formula: F*Population of the Community.

Where F is the sampling factor

F=Estimated sample size/ Total population of Communities

F=415/1180=0.35

Table 2: Selected communities (randomly) from each sub-district of Kpando Municipality and population per community.

Sub-municipality	Community	Population 10-14 years old	no. of households
Kpando	**Abanu**	241	802
Agbenorxoe	**Dafor-Tornu**	588	394
Torkor	**Tsitekorfe**	253	582
Sovie-Kudzra	**Kudzra newtown**	19	56
Gbefi-Gadza	**Gadza**	79	183
	Total	1180	2017

Table 3: Selected communities (randomly) from each sub-district of Kpando Municipality and proportionate sample size per community.

Sub-district	Community	Sample size per community (10-14 years old)
Kpando	**Abanu**	85
Agbenorxoe	**Dafor-Tornu**	207
Torkor	**Tsitekorfe**	89
Sovie-Kudzra	**Kudzra newtown**	6
Gbefi-Gadza	**Gadza**	28
	Total	**415**

3.5 Data collection methods & tools

Due to the COVID-19 pandemic context, the preventive measures recommended by the National COVID-19 response team supported by the Ghana Health Service Ethical Review Board were applied. It is within this context that the respondents and data collectors wear a nose mask, at least 2 metres distance was approximately maintained between them and hands were sanitised.

Children were interviewed using the questionnaire in English, translated in Ewe for a better understanding. A list of all chosen children and information on schistosomiasis awareness were obtained. Each child answered questions individually at house locations where confidentiality was maintained. Two research assistants were hired in the Municipality. They were trained on administering the questionnaire for two days to ensure a common understanding of the questions using English and translating into Ewe**.** Section by section, the methods were thoroughly reviewed, and the assistants also were oriented towards the purpose of the study, data collection, and procedures for handling data. Children were interviewed using a face-to-face approach but respecting the COVID-19 prevention protocol. This approach provided an opportunity for data collectors to explain issues for respondents and provided satisfactory answers to the questions. Each interview lasted 20 to 30 minutes.

The questionnaire was revised from a questionnaire previously validated (Muhumuza et al., 2013). It had closed, open-ended questions and discussed topics such as the sociodemographic characteristics and awareness of Schistosomiasis and its prevention.

3.6 Pre-testing of the research instrument

The questionnaire pre-testing took place in Aloyi community, one of the communities selected randomly from the Kpando Municipality. This community is not part of the selected communities for the study. The questionnaire was administered to children with selection criteria to ensure clarity and understanding of the questions. Pre-testing helped to test the accuracy of the questionnaire. The pre-testing also aided the validity and completeness of the research questions to be evaluated. An appropriate questionnaire adjustment was made to reflect the importance of the study. This pre-testing was done after obtaining ethical clearance.

3.7 Quality control, data management, and storage

The following steps to ensure the reliability and processing of information were taken:

1. Questionnaires were simple and easy to understand for the study.

2. Pre-testing the questionnaire was conducted in an environment with similar characteristics to the study area to check for the accuracy of variables and error detection.

3. Training was provided to research assistants to help the Principal Investigator with the data collection and data entry.

4. Field analysis was conducted to assist data collectors

5.For each day of the fieldwork of the Principal Investigator (PI), the data collected on each respondent was verified to ensure that the questionnaires were completed and answered correctly and that all information was collected accurately. Missing questionnaires were sorted out, and the study assistants were permitted to interview multiple respondents to replace missing ones.

6. The PI kept completed questionnaires under lock and security key, while processed information was stored on a computer with a code that is available only to the PI.

3.8 Data Processing and Analysis

The data collected were entered into Kobo toolbox software. Then, it was combined and edited with Excel. 365 and subsequently exported into Stata version 16. Thus, the raw data was cleaned and prepared to be suitable for analysis. The data were summarised using frequency, tables, and graphs. The continuous variables were tested for normal distribution using the Shapiro-Wilk test. The data was declared non-normally distributed when the p-value<0.05. The mean and the standard deviation were reported for normally distributed variables; on the

contrary, the median, the range, and the 25th, 75th quantiles were reported for non-normally distributed variables.

Bivariate analysis was used to evaluate the association of some of the categorical variables with the uptake of Praziquantel. Pearson-chi square test was conducted for variables with expected cell values equal to at least 5, and Fisher's exact test was done when this condition was not met. The odds ratios at a 95 % confidence interval were used to test the importance of the relationships between the uptake of Praziquantel and the independent variables.

A logistic regression analysis was conducted to assess the correlation between uptake and independents variables. The odds ratios at a 95 % confidence interval were also used. Significant associations at the univariate level (p-value<0.05) were included in the multiple logistic regression model. A suitable model was chosen based on the likelihood-ratio test.

3.9 Ethical clearance

3.9.1 Ethical and study area approval

Ethical approval was obtained from the Ghana Health Service (GHS) Ethics Review Committee (ERC) with approval number GHS-ERC 028/12/19. The administrative authorisation was obtained from the Volta Regional Director of Health Services, as well as the Municipal Health Directorate of the Kpando Municipality. Permission was sought from the leaders of the selected communities. Also, the NTDs office was informed about the study. The parents or guardians and the children of the sampled communities were officially informed. Informed consent and signed approval were sought from the parents or guardians. Informed assent was obtained from the participating subjects before interviewing them. Personal identifiers, such as names, were not recorded.

3.9.2 Potential Risks and Benefits

The study was safe except that it takes over part of the time of school-age children and their parents or guardians and the need of participants to provide some private information for the study. Also, they were not paid or given any other form of compensation for being in the research.

The benefit of the study is that it measured the uptake of Praziquantel mass-drug administration and identified the factors influencing uptake. These findings will facilitate the National Neglected Tropical Diseases Control Programme (NTDs) future praziquantel mass-drug administration. Also, Kpando Municipality Health Directorate will implement new strategies to tackle Schistosomiasis.

3.9.3 Confidentiality

Researchers did not share information about the children to anyone who did not work in the research study. All information provided was protected in this research, and only researchers directly involved in the study had access to it. The participation of the respondents was not discussed with anyone outside the research team. All responses were treated as confidential as no names were put on the questionnaires. Therefore, an anonymous identification number was used for each respondent

3.9.4 Voluntary participation/withdrawal

A copy of the information sheet and consent form was given to participants after it has been signed or thumb printed. The participation was voluntary, and the withdrawal was made possible at any point of the data collection without any judgment.

3.9.5 Protecting study participants in the era of COVID 19

All participants underwent handwashing with soap and running water or sanitised their hands with alcohol-based hand sanitisers. The study team provided water, soap, and hand sanitizers.

Participants wore a face mask before the beginning of the interview**.** Participants were taught how to wear, remove, and care for the reusable facemasks provided by the research team at no cost, and it was recommended to keep them on until the departure of the data collector. Physical distancing was maintained during the study visit, and participants complied with any restrictions to movements imposed by the national or local COVID-19 response team.

3.9.6 Protecting Research Study Teams

The preventive measures outlined above were also applied to the study team. All researchers ensured adequate protection by practising good personal hygiene through regular hand washing, the use of sanitisers, the wearing of facemasks and protective gloves. **S**ocial and physical distancing were observed, keeping at least 6ft between people.

CHAPTER FOUR

RESULTS

4.1 Summary of the 2019 praziquantel-albendazole preventive chemotherapy report

Kpando has a high endemicity for schistosomiasis. Hence, every year a single dose of Praziquantel is distributed in schools to SAC. The last school-based preventive chemotherapy (PC) for schistosomiasis control combined with Albendazole PC for Soil-Transmitted Helminths (STH) control, was done in Kpando Municipality from 4th to 8th November 2019. Before the PC, teachers were trained for two days, 30th and 31st October. According to the final report of this intervention, seventy-three schools were treated among the seventy-four of the Municipality. Therefore, the geographical coverage was 98.65% (73/74). A coverage of 86.26% was reported (11983/13891) for in-school SAC. However, the overall coverage, including in SAC and out SAC, was 42.14% (13392/31781). The main reasons for not receiving the preventive treatment were absenteeism (3.44%, 633), refusal of the intervention (6.62%, 1218), and presence of sickness the day of the PC (0.32%, 59). Adverse reactions due to the treatment were reported in a few cases (1.03%, 138). These findings above formed the summary of the last school-based targeted preventive treatment for schistosomiasis for SAC or 5 to 14 years-old children in Kpando Municipality. Following this PC intervention in 2019, the results of this study in selected communities in the municipality is presented below.

4.2 Results of selected communities in Kpando Municipality

4.2.1 Socio-demographic characteristics of respondents

A total of 462 children between the ages of 10 and 14 participated in the study. The mean age was 11.86 years (SD:0.07). The sex ratio was 1.07. The average (median) estimated distance

from the area of residence to the lake was 1 km, ranging from 1 to 30 km (Q1=1km, Q3=3km) and from the school to the lake 2 km, ranging from 1 to 50 km (Q1=1km, Q3=8km). The most represented ethnic group is Ewe (447, 96.75%), and half of the respondents were living in the Dafor-Tornu community. The main religion in the communities was Christianity (461, 99.78%) **(Tables 4)**. The more common survival income activities in the communities were fishing, fishmonger, farming, and trading. The children were schooling in 96% of the cases, and most of them were in Grade P1 to P3 (221, 56.49%) **(Table 4)**.

Table 4: Sociodemographic characteristics of respondents

Characteristic	Frequency (n=462)	Percentage (%)
Age		
<11	121	26.19
11-12	175	37.88
13-14	166	35.93
Mean age= 11.86	Standard deviation=0.07	Lowest age=10 Highest age=14
Distance from home to the lake		
Median=1.00	Q1=1.00 Q3=3.00	Lowest=1 Highest=50.00
Distance from school to the lake		
Median=2.00	Q1=1.00Q3=8.00	Lowest=1 Highest =30.00
Sex		
Female	223	48.27
Male	239	51.73
Community		
Abanu	92	19.91
Dafor-Tornu	231	50.00
Gadza	30	6.49
Kudzra-Newtown	9	1.95
Tsitekorfe	100	21.65
Religion		
Christian	461	99.78
Traditional	1	0.22
School attendance		
Yes	443	95.89
No	19	4.11
Level of education		
No formal education	19	4.11
P1-P3	261	56.49
P4-P6	157	33.98
JHS1-JHS2	25	5.41
Ethnicity		
Akan	2	0.43
Ewe	447	96.75
Ga	9	1.95
Other	4	0.87
Occupation of parent or guardian		
Farmer	116	25.11
Fisherman	106	22.94
Fishmonger	19	4.11
Trader	143	30.95
Other	78	16.88

n: Number of respondents, Q1: 25^{thquantile} Q3: 75^{thquantile}

All participants had access to an improved toilet facility at home. More than 90% were using a bathroom at home, but 4.55 % (21) declared that they were bathing mainly in the lake **(Table 5)**.

Table 5: Hygienic practices of respondents

Characteristic	Frequency (n=462)	Percentage (%)
Type of toilet at home		
Open Space in the bush	1	0.22
Open space around the house	1	0.22
Pit latrine	459	99.35
W.C	1	0.22
Type of bathing facility at home		
Bathroom	411	88.96
Lake/river	21	4.55
Open space around the house	30	6.49

n: number of respondents

4.2.2 Knowledge on schistosomiasis and Praziquantel MDA

Most of the participants reported that bathing (292, 63.20%) or swimming (86, 18.61%) in the lake was a risk factor for schistosomiasis infection. Nonetheless, six children reported drinking water from the lake as a risk factor for the disease. The main symptom for urinary schistosomiasis (blood in urine) was known by more than half of the children (277, 59.96%). The level of awareness on factors contributing to transmission (344, 74.46 %), symptoms (330,71,43%), and prevention (350,75.76%) of the disease was suitable for most of the children. More than 50% (272, 58.87%) of them knew that they were at risk of getting schistosomiasis **(Table 6).**

Table 6: Knowledge of Schistosomiasis, transmission, signs/symptoms, and prevention

Characteristics	Frequency (n=462)	Percentage (%)
Transmission risk factors*		
Bathing in the lake/river	86	18.61
Swimming in the lake/river	292	63.20
Washing in the lake/river	6	1.30
Drinking contaminated water	12	2.60
Urinate in the lake/river	16	3.46
Defecate in the lake/river	1	0.22
Awareness of transmission		
Aware	344	74.46
Unaware	118	25.54
Signs/symptoms*		
Blood in urine	277	59.96
Blood in stool	51	11.04
Abdominal pain	7	1.52
Vomiting	23	4.98
Diarrhea	5	1.08
Fever	27	5.84
Chills	6	1.30
Cough	5	1.08
Muscles aches	2	0.43
Dysuria	1	0.22
Awareness of signs/symptoms		
Aware	330	71.43
Unaware	132	28.57
Prevention methods*		
Avoiding bathing in the river/lake	79	17.10
Avoiding swimming in the river/lake	201	43.51
Avoiding washing clothes in the river/lake	7	1.52
Avoiding drinking water from the river/lake	8	1.73
Avoiding urination in the river/lake	4	0.87
Avoiding open defecation in the river/lake	2	0.43
Preventive praziquantel treatment	121	26.19
Awareness of SCH prevention		
Aware	350	75.76
Unaware	112	24.24
At risk of getting SCH		
Yes	272	58.87
No	179	38.74
Do not know	11	2.38

**Multiple choices question, n: number of respondents*

Most of the children had heard about the praziquantel MDA (449, 97.19%). More than half of them were informed about the preventive purpose of the MDA (237, 51.30%). Also, seventy-eight per cent of the respondents were aware of the target population of this MDA. The respondents agreed with the importance of MDA (452, 97.84%). Ninety per cent (90.04%) of them had received and swallowed Praziquantel during the last MDA (**Table 7)**.

Table 7: Praziquantel (PZQ) MDA

Characteristic	Frequency (n=462)	Percentage (%)
Have heard about preventive praziquantel treatment?		
Yes	449	97.19
No	13	2.81
Purpose of PZQ MDA		
Unknown	41	8.87
Prevent SCH	237	51.30
Treat SCH	160	34.63
Prevent and treat SCH	24	5.20
The target population of PZQ MDA		
Do not know	101	21.86
School-Age Children	361	78.14
Is it important to take PZQ MDA		
Yes	452	97.84
No	4	0.87
Do not know	6	1.30
Praziquantel uptake		
Yes	416	90.04
No	46	9.96

n: number of respondents

4.2.3 Factors associated with praziquantel MDA uptake

Among those who had taken Praziquantel, different events had occurred before and after the uptake. Thus, ninety per cent (375, 90.14%) of them had received health education on the disease and the intervention; and ninety-eight per cent (409, 98.32%) had eaten before the

uptake. Only four children (4, 0.96%) were afraid of the side effects of the drug before its administration **(Table 8)**.

Table 8: Events before uptake

Characteristic	Frequency (n=416)	Percentage (%)
Health education before uptake		
Yes	375	90.14
No	41	9.86
Had eaten before uptake		
Yes	409	98.32
No	7	1.68
Had a fear of side effects before uptake		
Yes	4	0.96
No	412	99.04

n: number of respondents

The most frequent event after the uptake was the presence of side effects. Moreover, more than half (218, 52.40%) of the children reported at least one side effect. Almost all the children (415, 99.76%) did not complain about the occurrence of the disease after uptake. None of them had the disease after the utilisation of the drug. Most of them (309, 74.28%) believed that there was no risk of getting infected after uptake (**Table 9**).

Table 9: Events after uptake

Characteristic	Frequency (n=416)	Percentage (%)
Had side effects after uptake		
Yes	218	52.40
No	198	47.60
Had a suspected schistosomiasis infection after uptake		
Yes	1	0.24
No	415	99.76
There is still a risk for SCH infection after uptake		
Yes	107	25.72
No	309	74.28
Had a confirmed schistosomiasis infection after uptake		
Yes	0	0
No	416	416

n: number of respondents

Among those who complained about side effects, diverse symptoms and signs were cited. Thus, some of the children had noticed one or more than one side effects. Some had vomited (40, 18.35%) or had nausea (4, 1.83%). Also, abdominal pain was present after uptake most of the time (208, 95.41%), same as dizziness (199, 91.28%) (**Table 10**).

Table 10: Type of side effect after uptake

Characteristic	Frequency (n=218)	Percentage (%)
Vomiting		
Yes	40	18.35
No	178	81.65
Nausea		
Yes	4	1.83
No	214	98.17
Abdominal pain		
Yes	208	95.41
No	10	4.59
Dizziness		
Yes	199	91.28
No	19	8.72

Among those who had not taken the drug (46, 9.96%) at the last MDA, different reasons had been noticed. The first reason was the non-involvement of non-schooling children (19,

41.30%). Likewise, all children who were not attending school had not received the drug, followed by the absenteeism (12, 26.09%) of those attending school the day of the intervention. Also, other factors related to parental support were involved, such as non-signed consent forms (8, 17.39%) or warning advice from the parent against the uptake of the drug (1, 2.17%) (**Table 11**).

Table 11: Non-uptake

Characteristic	Frequency (n=46)	Percentage (%)
Non-uptake reasons		
Not schooling	19	41.30
Absenteeism	12	26.09
Consent approval was not signed	8	17.39
Previous adverse side effects	3	6.52
Did not think that it is necessary	1	2.17
Did not eat before the intervention	1	2.17
Parent has worn against it	1	2.17
Sick	1	2.17

n: number of respondents

At the bivariate analysis level, a Chi-square test showed that the age group, the sex of the respondents, and the community were not associated with the uptake. Other factors, such as religion, ethnicity, occupation of parents, were also not associated with the uptake. Nevertheless, Fisher's exact test was performed to determine if school attendance or level of education is associated with the uptake of Praziquantel. The association between this latter and school attendance was statistically significant, the same as for the level of education ($p<0.001$). More children had taken the drug when they were attending school, but fewer than expected adhered to uptake among those who were not attending school. Thus, there is a relationship between attendance to school or the level of education and uptake of Praziquantel **(Table 12).**

Table 12: Bivariate analysis, socio-demographic factors, and praziquantel uptake among children in Kpando Municipality (Pearson chi-square/Fisher's exact test)

Characteristics	Yes (n=416)	No (n=46)	Test (df)	p-value
Age			Pearson chi2 (2) 2.3476	0.309
<11	112 (92.56)	9 (7.44)		
11-12	153 (87.43)	22 (12.57)		
13-14	151 (90.96)	15 (9.04)		
Sex			Pearson chi2 (1) 0.0613	0.804
Female	200 (89.69)	23 (10.31)		
Male	216 (90.38)	23 (9.62)		
Community			Fisher's exact	0.592
Abanu	83 (90.22)	9 (9.78)		
Dafor-Tornu	209 (90.48)	22(9.52)		
Gadza	26 (86.67)	4 (13.33)		
Kudzra Newtown	7 (77.78)	2 (22.22)		
Tsitekorfe	91 (91.00)	9 (9.00)		
Religion			Fisher's exact	1
Christian	415 (90.02)	46 (9.98)		
Traditional	0 (0)	1 (100)		
School attendance			**Fisher's exact**	**<0.001**
Yes	416 (93.91)	27 (6.09)		
No	0 (0)	19 (100)		
Level of education			**Fisher's exact**	**<0.001**
None	0 (0)	19 (100)		
P1-P3	250 (95.79)	11 (4.21)		
P4-P6	142 (90.45)	15 (9.55)		
JHS1-JHS2	24 (90.04)	1 (9.96)		
Ethnicity			Fisher's exact	0.154
Akan	1 (50)	1 (50)		
Ewe	403 (90.16)	44 (9.84)		
Ga	9 (100)	0 (0)		
Other	3 (75)	1 (25)		
Occupation of parent or guardian			Fisher's exact	0.431
Farmer	105 (90.52)	11 (9.48)		
Fisherman	98 (92.45)	8 (7.55)		
Fishmonger	19 (100)	0 (0)		
Trader	125 (87.41)	18 (12.59)		
Other	69 (88.46)	9 (11.54)		

p-value based on Pearson chi-square test or Fisher's exact test, significant p-value in bold, n: number of respondents

A chi-square test was done to determine if awareness on transmission factors, prevention measures, or the symptoms of the disease is associated with the uptake of MDA. None of these factors was associated with the uptake **(Table 13a)**. The following factors were associated with the uptake of the drug: awareness on Praziquantel MDA, the importance of MDA, knowledge on the purpose of the MDA. These associations were statistically significant, with a p-value<0.001**(Table 13a)**.

Table 13a: Bivariate analysis, Knowledge on Praziquantel MDA, schistosomiasis and praziquantel uptake among children in Kpando Municipality, August 2020 (Pearson chi-square/Fisher's exact test)

Characteristics	**Total sample n =462 (%)**			
	Yes (n=416)	No (n=46)	Test (df)	p-value
Awareness of transmission			Pearson chi2(1)1.3418	0.247
Aware	313 (90.99)	31 (9.01)		
Unaware	103 (87.29)	15(12.71)		
Awareness of signs/symptoms			Pearson chi2(1) 1.7600	0.185
Aware	301 (91.21)	29 (8.79)		
Unaware	115 (87.12)	17 (12.88)		
Any awareness of prevention			Pearson chi2(1) 0.0946	0.758
Aware	316 (90.29)	34 (9.71)		
Unaware	100 (89.29)	12 (10.71)		
Heard about Praziquantel MDA			**Fisher's exact**	**<0.001**
Yes	412 (91.76)	37 (8.24)		
No	4 (30.77)	9 (69.23)		
Target population (SAC)				
Yes	336 (93.07)	25 (6.93)		
No	80 (79.21)	21 (20.79)		
Purpose of Praziquantel MDA			**Fisher's exact**	**<0.001**
Do not know	25 (60.98)	16 (39.02)		
Prevent SCH	223 (94.09)	14 (5.91)		
Prevent and treat SCH	23 (95.83)	1 (4.17)		
Treat SCH	145 (90.63)	15 (9.38)		

p-value based on Pearson chi-square test or Fisher's exact test, significant p-value in bold, n: number of respondents

The uptake of the drug was also associated with the willingness to take Praziquantel at the next MDA (p-value<0.001). The support coming from the parents or guardians also determined a relationship with the uptake of Praziquantel, which was statistically significant (p-value<0.001) **(Tables 13b).**

Table 13b: Bivariate analysis, Knowledge on Praziquantel MDA, schistosomiasis and praziquantel uptake among children in Kpando Municipality, August 2020 (Pearson chi-square/Fisher's exact test)

Characteristics	**Total sample n =462 (%)**			
	Yes (n=416)	No (n=46)	Test (df)	p-value
SCH is a health problem in the area			Pearson chi2 (1) 3.7443	0.053
Yes	198 (92.96)	15 (7.04)		
No	218 (87.55)	31 (12.45)		
Praziquantel MDA is important			**Fisher's exact**	**<0.001**
Yes	412 (91.15)	40 (8.85)		
No	31 (12.45)	6 (60.00)		
At risk for SCH			Fisher's exact	0.146
Do not know	8 (72.73)	3 (27.27)		
Yes	247 (90.81)	25 (9.19)		
No	161 (89.94)	18(10.06)		
Willingness to take Praziquantel at the next MDA			**Fisher's exact**	**0.008**
Yes	407(90.85)	41 (9.15)		
No	9(64.29)	5(35.71)		
Support from parents or guardians			**Fisher's exact**	**<0.001**
Yes	411 (94.92)	22 (5.08)		
No	5 (25.00)	15(75.00)		
Do not know	0 (0)	9 (100)		
Support from teacher			**Fisher's exact**	**0.002**
Yes	413 (94.51)	24 (5.49)		
No	0 (0)	2 (100)		
Do not know	3 (75.00)	1 (100)		

p-value based on Pearson chi-square test or Fisher's exact test, significant p-value in bold, n: Number of respondents

At univariate logistic regression analysis, the following factors were positively associated with the uptake of praziquantel during the MDA: had heard about Praziquantel MDA(COR = 25.05,

95%CI: 7.36- 85.28, p-value < 0.001), SAC as the target population of MDA (COR = 3.53, 95%CI: 1.88- 6.62, p-value < 0.001), prevent as a purpose of praziquantel MDA (COR=1.43, 95%CI: 1.04-1.96, p-value=0.02), Praziquantel MDA importance (COR=15.45, 95%CI 4.18-57.04, p-value< 0.001) ,willingness to take praziquantel at the next MDA (COR=5.51, 95%CI: 1.76-17.23,p-value=0.008), had got support from parents or guardians (COR=89.67, 95%CI: 31.23- 257.45, p-value<0.001) (**Table 14a**).

Table 14a: Univariate and multiple Logistic regression analysis, factors and praziquantel uptake among children in Kpando Municipality.

Characteristics	COR (95%CI)	p-value	AOR (95%CI)	p-value
Age	0.94 (0.64 -0.39)	0.76		
<11	1			
11-12	0.56 (0.25- 1.26)	0.16		
13-14	0.81 (0.34- 1.91)	0.63		
Sex {Female}				
Female	1			
Male	1.08 (0.59-1.98)	0.80		
Distance from home to the lake	1.25 (0.99-1.57)	0.06		
Distance from school to the lake	1.07 (0.99-1.16)	0.08		
Awareness of transmission				
Unaware	1			
Aware	1.47 (0.76-2.83)	0.25		
Awareness of signs/symptoms				
Unaware	1			
Aware	1.53 (0.81- 2.90)	0.19		
Awareness of prevention				
Unaware	1			
Aware	1.11 (0.55-2.23)	0.76		
Heard about Praziquantel MDA				
No	1			
Yes	**25.05(7.36- 85.28)**	**<0.001**		
Target population SAC (school-age children)				
No	1			
Yes	**3.53 (1.88- 6.62)**	**<0.001**	**3.32 (1.68- 6.54)**	**0.001**

p-value based on univariate and multiple Logistic regression, significant p-value (p-value<0.05) in bold, n: Number of respondents, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio

At multivariate Logistic regression analysis, children who knew that the SAC was the target population of the MDA had 3.14 (AOR=3.14, 95%CI: 1.57- 6.30, p-value=0.001) greater odds of swallowing Praziquantel. The children who had an awareness of the purpose of Praziquantel MDA were more likely to take the drug. Thus, those who knew the prevention purpose of the MDA were 7.70 times more likely to take Praziquantel, compared to those who did not (AOR=7.70, 95%CI:3.16-18.77, p-value<0.001). Those who recognised the importance of the MDA are 8.06 times more likely to take Praziquantel compared to those who did not (AOR=8.06, 95%CI:1.78- 36.55, p-value=0.007). Also, those who were willing to take praziquantel at the next MDA had more than fourfold increased odds of taking the drug compared to those who were not (AOR=4.59, 95%CI:1.19-17.67, p-value=0.027) (**Tables 14a 14b**)

Table 14b: Univariate and multiple Logistic regression analysis, factors and praziquantel uptake among children in Kpando Municipality

Characteristics	COR (95%CI)	p-value	AOR (95%CI)	p-value
Purpose of praziquantel MDA	1.43 (1.04-1.96)	**0.02**	1.41 (1.03-1.94)	**0.03**
Do not know	1			
Prevent SCH	10.19 (4.45- 23.32)	<0.001	7.70 (3.16- 18.77)	**<0.001**
Prevent and treat SCH	14.72 (1.80-119.98)	0.01	13.75(1.61-117.09)	**0.016**
Treat SCH	6.19 (2.72- 14.08)	<0.001	5.23 (2.15- 12.70)	**<0.001**
SCH is a health problem in the area				
No	1			
Yes	1.88 (0.98- 3.58)	0.056		
Praziquantel MDA is important				
No	1			
Yes	15.45 (4.18-57.04)	**<0.001**	8.06 (1.78-36.55)	**0.007**
At risk for SCH	1.37 (0.80- 2.35)	0.26		
Do not know	1			
Yes	3.70 (0.92-14.86)	0.06		
No	3.35 (0.82-13.79)	0.09		
Willingness to take praziquantel at the next MDA				
No	1			
Yes	5.51 (1.76-17.23)	**0.008**	4.59 (1.19- 17.67)	**0.027**
Support from parents or guardians				
No	1			
Yes	89.67 (31.23-257.45)	**<0.001**		

p-value based on univariate and multiple Logistic regression, significant p-value (p-value<0.05) in bold, n: Number of respondents, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio

CHAPTER FIVE

DISCUSSION

This study found that the uptake of praziquantel for the SAC interviewed was 90.06%, and the overall coverage reported by the Municipality Health Directorate was 42.14%. Several factors influencing uptake were identified such as parental support, awareness, or knowledge of praziquantel mass-drug administration like knowing the purpose of the MDA or its target population and the willingness to take praziquantel at the next MDA. These factors were comparable to the ones identified by previous researches, but other factors were also present.

5.1 Praziquantel mass-drug administration uptake

Based on the Municipality Health Directorate Data, the in-school SAC coverage was 86.26%. This high coverage was related to the national high net enrolment ratio (86.16%), which includes only SAC (UNESCO Institute for Statistics, 2020). Furthermore, this argument was testified by the proportion of SAC enrolled in schools in this surveyed study in Kpando (443, 95.89%).

A high prevalence of 90.04% (375/462) was found for the uptake of praziquantel during the last MDA in Kpando Municipality. It was higher than the programme coverage of 82.6% reported for Ghana in 2016 (WHO PCT Data Bank, 2018). It was also higher than the Municipality coverage, which was 42.14% in 2019. Thus, this latter coverage was below the threshold recommended by WHO, which suggests coverage of at least 75% (Toor et al., 2018; WHO, 2001). Meanwhile, the uptake proportion registered was similar to the one recorded in a Ghanaian study done in the Greater Accra region, which showed 89.1% (420/519) (Cunningham et al., 2020). Although it targeted a broader age group (5 to17 years).

The target population of the PC conducted in November 2019 in the municipality of Kpando was larger (5-14years) than the surveyed population (10-14years). Since the proportion of uptake was higher than the recommended minimum, then the low coverage reported by the municipality health directorate helped to draw the following finding. The 5 to 9 years age group seems to have a negative effect on the coverage of praziquantel PC. This group of SAC may be uninformed about the intervention. They may also be out of school, making it more difficult for them to reach the schools, the day of the MDA.

The common disadvantages of School-based MDA are linked to the location itself and the target age group. The former tends to induce a lower uptake among SAC who are not enrolled in school and also not all SAC who are enrolled consistently go to school (Burnim et al., 2017). Thus, SAC, who were not enrolled in school, had not taken the drug in the survey. The latter also leaves out PSAC and adults at risk who are potential reservoirs (King et al., 2020). However, PSAC are also left out because of a lack of evidence on the efficacy and safety of the drug on this age group (Kemal, Tadesse, Esmael, Abay, & Kebede, 2019).

As this survey showed, among the leading income activities, fishing is widespread. Thus, adults are brought into contact with the contaminated lake water. As a result, they can also be a reservoir of the disease and will influence the objective of the programme. It will lead to a stagnant or higher prevalence of Schistosomiasis.

Moreover, it is essential to know that uptake and coverage are similar in these findings due to the design of the praziquantel PC. It is a directly observed treatment (DOT) supervised by trained teachers in schools like in the study done by Secor, Wiegand, Montgomery, Karanja, & Odiere (2020).

A study from Uganda, showed a lower uptake proportion, 28.2% (285/1,010) for the same age group compared to the present study (10-14 years old) (Muhumuza et al., 2013). However, the

Ugandan school enrollment ratio was low combined with other factors such as fear of side effects, lake of teacher support, and knowledge.

5.2 Factors influencing praziquantel uptake during the last mass-drug administration

In the present study from Kpando, diverse factors influenced the uptake during preventive chemotherapy. The age group and the gender were not associated with the uptake, as demonstrated in another Ugandan study (Chami et al., 2016). School attendance had a relationship with the uptake. As seen above, the children not attending school had not received the drug because they did not come to schools on the day of the mass-drug administration (Burnim et al., 2017). Similarly, the level of education was also associated with the proportion of uptake.

Those who had parental support or teacher support were more prone to take the drug, like in Muhumuza et al. (2013) study. Moreover, as said previously, before the onset of the intervention, teachers were educated, and parents gave their approval. Additionally, teacher support can be reinforced by incentives like demonstrated in Muhumuza, Olsen, Nuwaha, et al. (2015) study.

The awareness of Schistosomiasis was assessed in this study, and generally, the children had a basic knowledge of the disease. Thus, awareness of Schistosomiasis may not affect uptake. Nonetheless, six children reported that drinking contaminated water may lead to Schistosomiasis. Even though drinking contaminated water is more recognized for Soil-Transmitted Helminths transmission, children may become infected if their mouth or lips encounter schistosomes.

The Knowledge of Praziquantel MDA was also significantly associated with the outcome. To illustrate, those who had heard about praziquantel MDA or the purpose of the MDA were more

likely to take praziquantel, same as those who knew the target population of the intervention. Consequently, it emerges that most of the SAC who had received health education, especially on the praziquantel intervention from their teachers as advised by the programme, have swallowed the drug. Therefore, good health education on the MDA led to uptake. This needs to be continued and even improved since the outcome of the intervention depends on the awareness of the MDA. A study observed that knowledge of schistosomiasis transmission and prevention was linked to a greater likelihood of taking praziquantel (Muhumuza et al., 2013). As seen above, in Kpando municipality those who had heard about the MDA were more likely to swallow the drug. This is confirmed by Inobaya et al. (2018) who found that being informed about the MDA one week before the MDA improved uptake.

The needed Knowledge on praziquantel chemotherapy may also arise from parents; hence they may also receive health education. Similarly, parents and teachers who are more knowledgeable will influence the SAC knowledge and thus the uptake of praziquantel (Burnim et al. (2017); Muhumuza et al. (2013); Muhumuza, Olsen, Nuwaha, et al. (2015)).

There was also a relationship between uptake of the drug and the willingness to take praziquantel at the next MDA. The likelihood to retake praziquantel PC was higher among those who had received it during November 2019 intervention. It will help to sustain the control of SCH. On the contrary, other factors seem to discourage SAC from future uptake. For instance, the above findings showed that more than 50% of SAC reported side effects like vomiting, stomach pain, and dizziness. The fear of these side effects may lead to non-uptake in the future. Moreover, three children had not swallowed the PC because of fear of side effects.

Similarly, this negative influence was seen in Tanzania by Parisi et al. (2019) and Mali (Dabo et al., 2013). Because of that, SAC are encouraged to eat at home before coming to school on

the day of the MDA. For instance, it was proven in a study that swallowing the drug in the absence of food leads to lower uptake (Muhumuza, Olsen, Katahoire, & Nuwaha, 2015).

A randomized cluster trial found out the effectiveness of pre-treatment snacks on the uptake of praziquantel PC (Muhumuza et al., 2014). It seems to improve SAC tolerance to praziquantel and thus diminish the likelihood of side effects occurrence. The fact that two drugs, praziquantel, and albendazole, were given simultaneously may suggest that the SAC were complaining about both drug side effects. But praziquantel is known for its mild side effects (Erko, Degarege, Tadesse, Mathiwos, & Legesse, 2012). These side effects above were minor side effects that were probably managed by trained teachers.

The main reason for not swallowing the drug other than not schooling was absenteeism of in-school SAC on the day of MDA. Another incriminating reason was the absence of parental support. For example, some parents did not sign the consent form, which excluded their children from the intervention. Also, some parents had not fed their children as recommended on the day of MDA. In addition, a parent had warned against the MDA, indicating that the perception of some parents on the MDA is incorrect. Furthermore, a SAC thought that the MDA was not needful and did not receive the drug. It may also be explained by a lack of knowledge of the disease and the MDA.

Limitation of the study

Recall bias may have occurred about specific questions related to uptake. Also, the target population of the study was 10 to 14 years old different from the NTDs Programme and Municipality Health Directorate target population, which was 5 to 14 years old. The uptake of praziquantel was self-reported, and the prevalence of Schistosomiasis was not measured.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Praziquantel mass-drug administration is a crucial strategy for Schistosomiasis control. However, it is only useful if it is well framed and implemented in a way that encourages the target population to participate regularly in the intervention. Previous studies have highlighted diverse factors influencing the uptake and future mass-drug administration outcome. Many of these factors, such as the level of education, school attendance, knowledge of praziquantel mass-drug administration of children and parents and the fear of side effects, seem to be relevant regardless of the context of the country of the participants. In this study, the proportion of uptake was high at 90.04%, but the overall coverage reported by the Municipality Directorate was 42.13%. Thus, it appears that school-age children aged 5 to 9 were more prone to non-uptake.

6.2 Recommendations

Neglected Tropical Diseases Control Programme

The Neglected Tropical Diseases Control Programme should design and implement combined school-based and community-based praziquantel mass-drug administration. It should implement a pre-snack intervention on the day of the mass-drug distribution. Also, it is essential to reinforce the collaboration with other institutions like the Ministry of Education. Other implementation researches should be conducted on broader populations and other communities targeting all SAC groups, parents, and teachers.

Kpando Municipality Health Directorate

The Health Directorate should improve the uptake among 5 to 9 years school-age children. Health education of stakeholders on Schistosomiasis prevention and control needs to be intensified, and the messages must be adapted to the level of understanding of the population. The District Health Directorate and District Assembly should mobilize resources to implement health promotion interventions on Schistosomiasis.

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APPENDICES

Appendix A: Information Sheet for parents or guardians

i. **Title of Study:** Uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children in Kpando Municipality, Ghana

ii. **Introduction:** My name is Miss Comabani Flora Elodie Koudessi, and I am from the School of Public Health, University of Ghana, and research to identify the factors influencing the uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children in Kpando Municipality, Ghana.

iii. **Background and purpose of research**: This research objective is to assess the uptake of praziquantel mass-drug administration for schistosomiasis control among Children in selected communities in the Kpando Municipality. Specifically, the study has the following specific objectives: 1. To determine the proportion of praziquantel mass-drug administration uptake among children in selected communities in Kpando Municipality. 2. To assess the factors associated with praziquantel mass-drug administration uptake among children in selected communities in Kpando District. The research is being conducted by the principal investigator with the support of five research assistants.

iv. **Nature of research**: This research is done on children who are aged between 10 to 14 years old because they are more at risk of getting schistosomiasis, and they live in Kpando Municipality, a place where there is schistosomiasis. The results of this study will inform the design of new and old strategies to increase the uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children with that age group.

v. **Participants involvement:**

- **Duration /what is involved:** parents or guardians will sign a consent form that will permit us to conduct the study on the children. Also, the children will have to give their assent.

We will ask them questions about schistosomiasis and praziquantel mass-drug administration**.** The interview will take about 30 minutes.

- **Potential Risks:** the study is completely safe.
- **Benefits:** the study will help to improve the implementation of the next Mass-Drug Administration
- **Costs:** there will not be any costs incurred.
- **Compensation:** you will not be paid for being in the research.
- **Confidentiality:** We will not tell other people that the selected children are in this research, and we will not share information about them to anyone who does not work in the research study. After the research is over, you, the children, and the parents will be told what the findings are.

Information about children that will be collected from the research will be put away, and only the researchers will be able to see it. Any information about them will have a number on it instead of their name. Only the researchers will know what their number is, and we will lock that information up with a lock and key. It will not be shared with or given to anyone except Comabani Flora Elodie Koudessi, and TDR-WHO.

- **Voluntary participation/withdrawal:** children do not have to be in this research if you do not want to be. It is up to you. If they decide not to be in the research, it is okay, and nothing changes. This is still their school; everything stays the same as before. Even if they say "yes" now, they can change their mind later, and it is still okay.
- **Outcome and Feedback:** Feedback will be given to participants.
- **Funding information:** Tropical Diseases Research- World Health Organization
- **Sharing of participants Information/Data:** When we will finish with the research, I will sit down with you and the parents, and I will inform you about what we learned. I will also give you a paper with the results written down. Afterwards, we will be telling more people,

scientists, and others, about the research and what we found. We will do this by writing and sharing reports and by going to meetings with people who are interested in the work we do.

- **Protecting study participants in the era of COVID 19**

a. All participants will undergo handwashing with soap and running water or sanitize their hands with alcohol-based hand sanitizers on arriving at the data collector. Water, soap, and/or hand sanitizers will be provided by the study team.

b. All participants and data collectors will wear or be encouraged to wear a face mask before conducting the interview.

c. Participants will be taught how to wear, remove, and care for the reusable or disposable facemasks. All participants will be given a face mask and also recommended to keep it on until the departure of the data collector.

d. The facemasks will be provided by the study teams at no cost to participants.

e. Physical distancing will be maintained during the study visit.

f. Participants will comply with any restrictions to movements imposed by national or local COVID-19 response team (e.g., self-quarantine, isolation, lockdown)

g. Participants will provide information to the study team on any COVID-19 tests that they may have had since their last study visit.

- **Protecting Research Study Teams:**

a. The preventive measures outlined above also apply to study teams.

b. All researchers will ensure adequate protection by practising good personal hygiene through regular hand washing, the use of sanitizers, protective gloves, and wearing facemasks.

c. Social/physical distancing will be observed, keeping at least 6ft between people.

- Provision of Information and Consent for participants: A copy of the Information Sheet and Consent form will be given to you after it has been signed or thumb-printed to keep.

- **Provision of Information and Consent for participants:** A copy of the Information Sheet and Consent form will be given to you after it has been signed or thumb-printed to keep.

Whom to Contact for Further Clarification/Questions:

1. **Principal investigator**: Comabani Flora Elodie Koudessi

   Department: University of Ghana/ School of Public Health

   Mobile: +233-575-430547**Email**:comanbani@gmail.com

2. **Ghana Health Service Ethics Review Committee Administrator**

   Nana Abena Apatu

   Mob: 0503539896 **Email**: ethics.research@ghsmail.org

Appendix B: Consent form for parents or guardians

Study title: Uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among children in Kpando Municipality, Ghana

Participants' statement

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read, and satisfactorily explained to me in a language I understand. I fully understand the contents and any potential implications as well as my right to change my mind (i.e., withdraw from the research) even after I have signed this form.

I voluntarily agree for the child to be part of this research.

Name or Initials of a parent or guardian……ID Code …….

Parent or guardian Signature……...OR Thumb Print……

Date…….

INVESTIGATOR STATEMENT AND SIGNATURE

I have accurately read out the information sheet to the parent, and to the best of my ability, making sure that he/she understands that the following will be done: asking questions about the uptake of praziquantel according to the questionnaire.

I certify that the parent has been given ample time to read and/or learn about the study. All questions and clarifications raised by the participant have been addressed.

P.I or Research Assistant name…….

Signature …….

Date…….

Appendix C: Information Sheet for children

i. **Title of Study:** Uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children in Kpando Municipal, Ghana

ii. **Introduction:** My name is Miss Comabani Flora Elodie Koudessi, and I am from the School of Public Health, University of Ghana, and research to identify the factors influencing the uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children in Kpando Municipal, Ghana. We spoke to your parent/guardian about this research, and they know we are asking you for your support as well.

iii. **Background and purpose of research**: We are doing this study to find out the acceptance of praziquantel mass-drug administration for schistosomiasis control among children in selected communities in the Kpando Municipal. Specifically, the study has the following specific objectives: 1. To determine the proportion of praziquantel mass-drug administration uptake among children in selected communities in Kpando Municipality. 2. To assess the factors associated with praziquantel mass-drug administration uptake among children in selected communities in Kpando Municipality. The research is being conducted by the principal investigator with the support of five research assistants.

iv. **Nature of research**: This research is done on children who are your age-between 10 to 14 years old because you are more at risk of getting schistosomiasis, and you live in Kpando Municipality, a place where there is schistosomiasis. The results of this study will inform the design of new and old strategies to increase the uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among children.

v. **Participants involvement:**

- **Duration /what is involved:** your parent will sign a consent form. Also, you will have to give your approval. We will ask you questions about schistosomiasis and praziquantel mass-drug administration**.** The interview will take about 30 minutes.
- **Potential Risks:** the study is completely safe.
- **Benefits:** the study will help to improve the implementation of the next Mass-Drug Administration
- **Costs:** there will not be any costs incurred.
- **Compensation:** you will not be paid for being in the research.
- **Confidentiality:** The people in our research team will know you are taking part. Nobody else will know because we will give you a number for the study instead of using your name, and we will lock that information up with a lock and key. Information about you that will be collected from the research will be put away, and no-one but the researchers will be able to see it. It will not be shared with or given to anyone except Comabani Flora Elodie Koudessi, and TDR-WHO.
- **Voluntary participation/withdrawal:** If you decide not to be in the research, it is okay, and nothing changes. Everything stays the same as before. Even if you say "yes" now, you can still stop any time, and it is still okay.
- **Outcome and Feedback:** We will put the information in medical magazines that researchers, doctors, and nurses read. We will also write a summary of the results for you to read if you would like.
- **Feedback to participant:** feedback will be given by providing a summary report of the key findings in a language you can understand
- **Funding information:** Tropical Diseases Research- World Health Organization
- **Sharing of participants Information/Data:** We will not tell anyone what you say unless we are worried about your safety or the safety of another person. If

this happens, we will ask you if it is okay for us to talk to your mum, dad, guardian, or doctor so that we can help.

- **Provision of Information and Consent for participants:** A copy of the Information sheet and Assent form will be given to you after it has been signed or thumb-printed to keep.

Whom to Contact for Further Clarification/Questions:

1. **Principal investigator**: Comabani Flora Elodie Koudessi

   Department: University of Ghana/ School of Public Health

   Mob: +233-575-430547

   Email: comanbani@gmail.com

2. **Ghana Health Service Ethics Review Committee Administrator**

   Nana Abena Apatu

   Mob: 0503539896

   Email: ethics.research@ghsmail.org

Appendix D: Assent form for children

Study title: Uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children in Kpando Municipal, Ghana

Participants statement

I acknowledge that I have read or have had the purpose and contents of the Participants Information Sheet read, and satisfactorily explained to me in a language I understand. I fully understand the contents and any potential implications as well as my right to change my mind (i.e., withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of the child……. ID Code…….

child Signature ……...OR Thumb Print……

Date…….

INVESTIGATOR STATEMENT AND SIGNATURE

I have accurately read out the information sheet to the child, and to the best of my ability, making sure that he/she understands that the following will be done: asking questions about the uptake of praziquantel according to the questionnaire.

I certify that the child has been given ample time to read and/or learn about the study. All questions and clarifications raised by the participant have been addressed.

P.I or Research Assistant name …….

Signature …….

Date…….

Appendix E: Questionnaire

Topic: Uptake of Praziquantel Mass-Drug Administration for Schistosomiasis Control Among Children in Kpando Municipal, Ghana

 This questionnaire is part of a research by our student MISS COMABANI FLORA ELODIE KOUDESSI, towards the award of a Master's degree in public health from the University of Ghana, Legon.

 This research objective is to assess the uptake of praziquantel mass-drug administration for schistosomiasis control among Children in the Kpando Municipality.

Interview Date: _____ DISTRICT: Kpando Municipality

Interviewer Name: _____ Interviewer Code: _____

(All information in this questionnaire is confidential).

NB: ONLY CHILDREN WITHIN 10 TO 14 YEARS OLD IN THE SELECTED COMMUNITIES MUST BE INTERVIEWED. PLEASE DO NOT DISCARD THIS QUESTIONNAIRE.

GIVE IT BACK TO THE COORDINATOR EVEN IF IT IS DAMAGED.

Sub-district: _____Questionnaire No: _____

Community: _____ Phone No. of the parent or guardian: _____

Date: _____

1	Date of birth of the child	
2	Age of the child (years)	
3	Sex of the child	Male [] Female []
4	School attendance	Yes [] No []
5	Name of the school the child attends	
6	Type of the school	Public school [] Private school []
7	Grade in school	
8	Residence type	Rural [] Peri-urban []
9	Name of the Household	
10	Distance school/residence from the lake	
11	Religion of respondent	Christian [] Muslim [] Traditional [] other []
12	Sex of parent or guardian	Male []

		Female []
13	The profession of parent or guardian	1.Fisherman [] 2.Farmer [] 3.Trader [] 4.Other []
14	Ethnicity	Ewe [] Akan [] Ga [] Other []
15	Type of toilet facility at home	1.Pit latrine [] 2. Open space around the house [] 3. W.C [] 4. Other []
16	Type of bathing facility at home	1.Lake/river [] 2.Bathroom [] 3.Open space around house [] 4.Other []
17	Type of toilet facility in the school	1.Pit latrine [] 2.Open space around the house [] 3. W.C [] 4. Other []
18	Knowledge of schistosomiasis transmission	1.Bathing in the lake/river [] 2.Swimming in the lake/river [] 3.Washing clothes in the lake/river [] 4.Drinking contaminated water [] 5.Consumption of dirty fruits [] 6.Urinate in the lake/river [] 7.Open defecation in water []
19	Knowledge of schistosomiasis signs and symptoms	1.Blood in urine [] 2.Problems passing urine (pain, difficulty) [] 3.Blood in the stool or faeces [] 4.Abdominal pain [] 5.Vomiting [] 6.Diarrhea [] 7.Fever [] 8.Chills [] 9.Cough [] 10.Muscle aches []

20	Knowledge of behavioural schistosomiasis prevention	1. avoiding bathing in the river [] 2. avoiding washing clothes in the river [] 3. avoiding drinking water from the river [] 4. avoiding open defecation [] 5. avoiding open urination [] 6. avoiding eating dirty fruits []
Knowledge of preventive praziquantel treatment		
21	What is the purpose of praziquantel treatment	Prevent Schistosomiasis [] Treat Schistosomiasis [] I do not know []
22	Have you heard about preventive praziquantel treatment?	Yes [] No []
23	Who take preventive praziquantel treatment?	School-age children [] Children [] Adolescents []
Uptake praziquantel preventive treatment		
24	Have you swallowed praziquantel at the last mass-drug administration?	Yes [] No []
Events before and after uptake		
25	Health education before uptake	Yes [] No []
26	Events before praziquantel preventive treatment uptake	Eating before taking praziquantel [] Fear of side effects before uptake [] None of the above []
27	Events after praziquantel preventive treatment uptake	Side effects after uptake [] Suspected Schistosomiasis infection after uptake [] Confirmed schistosomiasis infection after uptake [] None of the above []
28	Type of side effect(s)	1. Vomiting [] 2. Nausea [] 3. Abdominal pain [] 4. Dizziness [] 5. Other []

Reasons for non-uptake		
29	Have you taken praziquantel at the last mass-drug administration? (if no)	Did not eat before the intervention [] The bitter taste of praziquantel [] Absenteeism [] Consent approval was not signed or given from the parents or guardians [] Did not think that it is necessary to take praziquantel every year [] praziquantel intervention is not done in your school [] Fear of side effects [] Previous adverse side effects [] Other []
30	Is schistosomiasis a problem in your area?	Yes [] No [] I do not Know []
31	Do you think that you are at risk of getting Schistosomiasis	1. Yes [] 2. No [] 3. I do not know []
32	is it important to take preventive treatment for schistosomiasis?	1. Yes [] 2. No [] 3. I do not know []
33	Do you think that your parent or guardian supports praziquantel preventive treatment?	1. Yes [] 2. No [] 3. I do not know []
34	Do you think that your teachers support preventive treatment like praziquantel?	1. Yes [] 2. No [] 3. I do not know []
35	Willingness to take praziquantel at the subsequent mass-drug	1. Yes [] 2. No []