

**FACTORS INFLUENCING COMPLIANCE TO MASS DRUG ADMINISTRATION FOR
SCHISTOSOMIASIS IN PRIMARY SCHOOLS ALONG THE SHORES OF LAKE
VICTORIA, KENYA**

BY

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DECLARATION

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I hereby declare that this thesis is my original work and has not been submitted for an award of a degree or diploma in any other university or college.

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DEDICATION

This thesis would not have been completed without the support by my cherished parents,
Raphael and Janet Ongutu to whom this work is dedicated.

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ABSTRACT

Schistosomiasis is endemic in Kenya along the Coast, Lower Eastern, and the Lake Victoria Basin. Its prevalence ranges from 5% to 100% and is highest along the shores of Lake Victoria, with those most at risk aged between 5–14 years. To control this menace and eventually eliminate it, praziquantel distribution using mass drug administration (MDA) strategy was for the first time done in the year 2011 in targeted areas in western Kenya, with low compliance levels registered in most schools with high prevalence along the shores of Lake Victoria. Low MDA coverage would eventually act as the focal points for transmission and re-infection hence the need to evaluate the reasons that influenced MDA compliance. A cross-sectional study was carried out to primarily investigate factors that influenced compliance on a first time MDA exercise amongst school going children in areas with $\geq 25\%$ prevalence of schistosomiasis along the shores of Lake Victoria in Kenya. The study covered primary school health teachers and pupils, whose schools took part in the MDA exercise. Fisher's method was used to get a sample size of 411 pupils from a study population of 12,113. Systematic sampling technique was used to sample the pupils from the sample frame. Seventy five health teachers were also purposively recruited in the study. Both qualitative and quantitative approaches were used in data collection. Pre-tested interviewer-administered questionnaires were used to collect quantitative data from the pupils. Eight group discussions were used to collect qualitative data from the health teachers. Quantitative data were summarized and analyzed using descriptive inferential statistics. This involved the use of bivariate techniques; Fisher's exact or Pearson's chi-square test to test for correlation between the independent and dependent variables. The variables that were significant were subjected to logistic regression to assess for the independent predictors of non-compliance. Qualitative data were summarized and analyzed using ATLAS t.i. qualitative data analysis software. Knowledge on the MDA programme and disease were the strongest predictors of non-compliance, with the odds of being MDA non – compliant being significantly increased for those pupils who didn't know the reasons for swallowing the drug ($AOR = 22.665$, 95% CI = 5.187 – 99.040, $p \leq 0.001$), as well as for those who had never heard of schistosomiasis ($AOR = 12.345$, 95% CI = 3.729 – 40.871, $p \leq 0.001$) respectively. Quantitatively, most of the science health teachers were more knowledgeable and aware of schistosomiasis, than their other counterparts. Majority of the health teachers perceived community members (parents) lacked confidence on the role they played, as “drug distributors”. Up to 7.8% of the non-compliant population did not know any of the perceived benefits associated with the MDA exercise, though, the health teachers perceived as a benefit the improvement in the school attendance and the pupils health in general. Finally, the study noted that some of the other community-specific factors associated with MDA non-compliance, included: fear of adverse side effects, fear of the size and dosage of the drug, fear of meeting referral treatment costs by both the parent and the school administration and lack of team work amongst teachers in carrying out MDAs. Therefore, to improve on MDA compliance, there is need to involve the various stakeholders, (school, community and pupils) at various levels, in: training health teachers, drug distributor selection, Pre-MDA sensitization and the final MDA execution. These findings helped determine factors that influence compliance on a first time MDA exercise in areas endemic for schistosomiasis.

ACRONYMS

MDA:	Mass Drug Administration
NTD:	Neglected Tropical Disease
RS:	Random Start
SCORE:	Schistosomiasis Consortium for Operational Research and Evaluation
SPSS:	Statistical Package for Social Sciences
SI:	Sampling Interval

OPERATIONAL DEFINITIONS

Neglected Tropical Diseases: are a group of tropical infections which are especially endemic in low-income populations in developing regions of Africa, Asia, and the Americas, and for which there has been limited attention to control and eliminate in the past.

Mass Drug Administration: provision of drugs to entire populations, irrespective of disease status, in order to control, prevent or eliminate common or widespread disease.

MDA Compliance: the act of participating in the MDA exercise.

Health teacher: teacher in charge of health matters in school.

Kato Katz technique: a laboratory method for preparing human stool samples prior to searching for parasite eggs.

Treatment coverage, per school: measured using the following formula;

[Number treated/ Number enrolled (Total number of pupils in the class register)] x 100

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CHAPTER ONE

INTRODUCTION

1.1 Background Information

Neglected tropical diseases (NTDs) inflict a significant health and socio-economic burden in the tropics and subtropics particularly in sub-Saharan Africa. In Kenya, the NTDs of great public health importance include: lymphatic filariasis (LF), schistosomiasis, soil transmitted helminthiasis, trachoma and leishmaniasis. Schistosomiasis is the leading NTD in terms of socio-economic impact, and approximately more than 700 million people were at risk of its infection globally, as of mid-2009 with more than 200 million people found in Africa (WHO, 2011). In sub-Saharan Africa alone, about 130,000 to 150,000 deaths occur per year as a result of non-functioning kidney (from *S. haematobium*) and haematemesis (from *S. mansoni*) (WHO, 2012). Schistosomiasis in children can result in stunting, wasting, diminished physical fitness, impaired memory and cognition which combine to reduce educational performance, school attendance, future adult productivity, wage-earning capacity and finally the gross national productivity (Chitsulo *et al.*, 2000; Guyatt, 2000; Crompton and Nesheim, 2002). Schistosomiasis is currently endemic in 74 tropical countries in Africa, the Caribbean, South America, East Asia, and the Middle East with 85 % of the cases being in Africa due to lack of morbidity control measures (USAID, 2014). In Kenya, approximately 6 million people are estimated to be at risk of schistosomiasis infection. Of those at risk, 70 % are aged between 5–14 years which accounts for 28% of the total Kenyan population (Chitsulo *et al.*, 2000; KNBS, 2010). Both *S. mansoni* and *S. haematobium* are endemic, along the Coast, Lower Eastern, and the Lake Victoria Basin in Kenya (MoPHS, 2011; NTD, 2013). The prevalence in these endemic areas ranges from 5% to 100% with the highest being along the shores of Lake Victoria (Onkanga *et al.*, 2016).

Praziquantel is currently the leading drug for treating schistosomiasis infection and has been in use for the last 30 years in many countries (WHO, 2013). Using mass drug administration (MDA) strategy, many countries that were once endemic for schistosomiasis have since either successfully eliminated this menace or controlled it to very low morbidity levels (WHO, 2012). The success of programs to eliminate schistosomiasis depends in large part on their ability to achieve and sustain high levels of compliance with MDA among the at risk populations.

In Kenya, most MDA studies were conducted on lymphatic filariasis, along the Coast with the focus being the adult populations in the community. In these studies, advanced knowledge of the programme and the disease of interest were noted as some of the factors that greatly contributed to MDA compliance at the community level, with the choice of the drug distributor having an influence on the knowledge levels. The studies also associated using health professionals as drug distributors in the community to MDA compliance with the perception of one's own risk having an influence on MDA compliance too. In addition, these studies also identified other community specific factors for non-compliance to include; Misconceptions theories about the treatment, individual health status and current use of other medications at the time of the MDA activity. Gender, age, area of residence (rural or urban), prevalence rate of the disease in the areas of residence and household income of families were also identified with adverse events being the main factor for Non-compliance (Krentel *et al.*, 2013; Secor, 2016). Though numerous MDA for schistosomiasis have been conducted in schools in sub-Saharan Africa, no studies have been done on the factors influencing MDA compliance for a first time MDA exercise for schistosomiasis control in Kenya, and particularly along the shores of Lake Victoria, where school going age children are most at risk.

It is in this context that this study, evaluated the perspectives and experiences of both the health teachers and the 12-17 year old pupils on the first time MDA of praziquantel in schools with $\geq 25\%$ prevalence of schistosomiasis along the shores of Lake Victoria, Kenya. This was done after a SCORE programme led MDA that took place between the months of March and April 2011 with the aim of evaluating the different MDA approaches (i.e. School based treatment (SBT) and Community wide treatment (CWT) using praziquantel. The objective of this evaluation was to improve on the MDA delivery strategies. Therefore in the study, schools in areas with moderate to high prevalence of schistosomiasis ($\geq 25\%$) and within a radius of 5 km from the lake were enrolled, from eight sub-counties and MDA conducted using their health teachers as the main drug distributors. On evaluation of the school based treatment arm, it was realized that there was MDA non-compliance amongst pupils hence informing the current study.

1.2 Statement of the Problem

School going children bare the highest burden of schistosomiasis due to their activities. Hence treatment and control measures should primarily focus on this population. Although MDA

has been shown to be effective in control and elimination of schistosomiasis in other parts of the world, its compliance in schools has remained a challenge especially for first time MDAs. This is due to insufficient information on school related factors associated with first time MDA compliance in schools. This study therefore gave an ideal opportunity to capture and document the perceptions and experiences of the different stakeholders on issues to do with MDA compliance in schools to help improve first time MDA compliance in schools hence reducing schistosomiasis transmission.

1.3 Objectives of the Study

1.3.1 Main objective

To investigate factors that influenced compliance on a first time MDA exercise amongst school going children in areas with $\geq 25\%$ prevalence of schistosomiasis along the shores of Lake Victoria in Kenya.

1.3.2 Specific objectives

1. To assess the level of knowledge on schistosomiasis and the MDA programme amongst the school going children aged 12-17 years and their health teachers along the shores of Lake Victoria in Kenya.
2. To determine the perception of the community as reported by the health teachers on the role of a health teacher as a drug distributor in the program along the shores of Lake Victoria in Kenya.
3. To determine the perceived benefits (by pupils and health teachers) associated with the MDA exercise along the shores of Lake Victoria in Kenya.
4. To determine other community specific factors for non-compliance to an MDA exercise along the shores of Lake Victoria in Kenya.

1.3.3 Research Questions

1. What is the level of knowledge on schistosomiasis and the MDA programme amongst the school going children and their health teachers along the shores of Lake Victoria in Kenya?

2. What is the perception of the community on the role of a health teacher as a drug distributor, as reported by the health teacher along the shores of Lake Victoria in Kenya?
3. What are the perceived benefits of the MDA exercise to the pupils and health teachers along the shores of Lake Victoria in Kenya?
4. What are the other community specific factors for non-compliance to an MDA exercise along the shores of Lake Victoria in Kenya?

1.4 Significance of the study

The study determined factors that influence compliance on a first time MDA exercise in areas endemic for schistosomiasis. Hence understanding these factors would assist in planning for a first time MDA exercises in areas endemic for schistosomiasis. Furthermore, identified factors would help in rolling out programmes that enhance MDA compliance and eventually reducing schistosomiasis transmission within the affected communities.

CHAPTER TWO

LITERATURE REVIEW

2.1. Epidemiology of Schistosomiasis

Schistosomiasis is a tropical disease caused by helminth worms of the genus *Schistosoma*. It causes morbidity, mostly in poor rural communities and its transmission is closely related to human utilization of fresh water resources (WHO, 2014). Eggs produced by the adult female worms in the human host are released in either stool or urine, some of which get trapped in tissues causing schistosome related *S. haematobium* (urino-genital disease) and *S. mansoni* (intestinal disease with liver pathology) (WHO, 2014).

Globally, 200 million cases of schistosomiasis are reported (Aagaard, 2008) with at least 130,000 to 150,000 deaths per year (WHO, 2012). In Kenya, approximately 6 million people are at risk of schistosomiasis with the three major endemic regions being the Coast, Lower Eastern and the Lake Victoria Basin. In the coastal strip there is only the *S. haematobium* while in Taveta, some parts of Lower Eastern and the Lake Victoria region, both *S. haematobium* and *S. mansoni* are present (MoPHS, 2011). The prevalence of schistosomiasis ranges from 5% to 100% in these endemic regions of Kenya with it being highest at the shores of Lake Victoria (Onkanga *et al.*, 2016).

To reduce this disease burden globally, mass drug administration (MDA) using praziquantel has been the strategy of choice. However in Kenya, MDA in schools was recently implemented for the very first time nationally. There was therefore a need to evaluate factors that would affect treatment compliance in order to ensure success of first time MDAs.

2.2 Level of Knowledge on Schistosomiasis and the MDA Programme

Studies in the Philippines, India, Sri Lanka, Uganda, Ghana, and Kenya have reported that one of the most important factors associated with motivating compliance and increasing treatment coverage in communities was advance knowledge of the MDA programme (Amarillo *et al.*, 2008; Cantey *et al.*, 2009; Cantey *et al.*, 2010; Hodges *et al.*, 2012) and that of the disease of interest (Aswathy *et al.*, 2009; Cantey *et al.*, 2009; Cantey *et al.*, 2010; Hodges *et al.*, 2012; Njomo *et al.*, 2012). In addition, studies from Uganda have also shown that, the choice of the drug distributor influenced knowledge levels among community members. i.e. the uptake of MDA was more likely if the respondents were knowledgeable about the disease of interest and

reported to have received the education from the health personnel (Tuhebwe *et al.*, 2015). In school, Health teachers are the drug distributors hence their support to pupils in terms of programme sensitization and health education will influence compliance either positively or negatively. Hence, there was need to assess the level of knowledge on schistosomiasis and the MDA programme amongst the school going children aged 12-17 years and their health teachers as a potential risk factor for MDA compliance in schools.

2.3 Community Perception, on the Role of Health Teacher as Drug Distributor, in the Programme

Community based studies have shown that the choice of the drug distributor (whether he/she is a health professional or just a member of the community) has an influence on MDA compliance in the community. It has been reported that health professionals if used as drug distributors, contributed positively to compliance since they were trusted with the MDA exercise by the community given that they were perceived as government representatives (Gunawardena *et al.*, 2007b; Amarillo *et al.*, 2008; Hayley *et al.*, 2010; Mahalakshmy *et al.*, 2010; Nujum, 2011; Patel, 2012; Krentel *et al.*, 2013). In addition, success of an MDA activity was based on the involvement of the community in selecting the community drug distributor and that the credibility of the person to be selected in the community had to be taken into consideration (Katabarwa, 2000a; Ramaiah *et al.*, 2001; Babu & Satyanarayana, 2003b; Gunawardena *et al.*, 2007b; Hayley *et al.*, 2010; Krentel *et al.*, 2013). However, in all these studies none of them addressed the community perception on the role of a health teacher as a drug distributor in a schistosomiasis control programme. Those found only addressed the health teacher's role in intestinal helminthes programme (Brooker *et al.*, 2001; Eneanya and Anikwue, 2006; Ulukanligil, 2006). Since children behavior and attitude can be potentially shaped by the closest social circles they interact with (peers, teachers, family members) (Krug *et al.*, 2002), it was important to determine the perception of the community on the role of the health teacher as a drug distributor in a schistosomiasis control programme in primary schools.

2.4 Perceived Benefits Associated with the MDA Exercise

Perceived benefits are one's opinion of the benefits of MDA to the individual and the society in reducing the threat (Krentel *et al.*, 2013). The perception among adults in the community in both LF and schistosomiasis studies is that being able to perceive one's own risk has an influence on MDA compliance and that those individuals who do not perceive themselves to be at risk of LF or schistosomiasis infection, are less likely to take part in MDAs (Aswathy *et al.*, 2009; Cantey *et al.*, 2009; Kumar *et al.*, 2009; Cantey *et al.*, 2010; Pattanshetty *et al.*, 2010; Krentel *et al.*, 2013). Studies from Sri Lanka, India and the Philippines have shown that, those who are able to personalize the benefits of an MDA for their own individual health are likely to be MDA compliers (Babu and Satyanarayana 2003a; Nandha *et al.*, 2007; Babu and Mishra 2008; Aswathy *et al.*, 2009) and that understanding that MDA is beneficial, is associated with increased compliance (Gunawardena *et al.*, 2007b). All these studies have associated perceived benefits to compliance, with the choice of the drug distributor, being a confounding factor. Since the benefits of the program were perceived partly in relation to how they are communicated by the drug distributor in the program. None of these past studies have addressed the perceived benefits of MDAs amongst school going children, with health teachers as their drug distributors. Hence this necessitates evaluation of their perception on the benefits of the MDA exercise in schools as opposed to the general community.

2.5 Other Community Specific Factors for Non – compliance on MDA

Community specific factors for non-compliance differ depending on the disease of interest and whether it is a first time MDA or not. MDAs targeting LF and schistosomiasis have been reported to elicit a lot of negative reactions from the community as opposed to MDAs targeting other helminthes, inevitably if it is a first time MDA. One of the main factors to be associated with a first time schistosomiasis MDA is adverse events, associated with dying worms especially the first time someone is treated when the worm burden tends to be highest, can lead to non-compliance in receiving follow-up treatments (Secor, 2016). Other factors associated with first time MDA non-compliance include; the recipient's personal characteristics such as gender, age and personal health at the time of MDA. That is, whether or not the individuals are taking other medications at the time of MDA. Female gender has often been associated with low first time MDA compliance rates. Reasons for the low compliance rates have included fear of being given the drug while one is pregnant since pregnant women are not eligible for MDA. This was

the case in Haiti, where women of child bearing age were excluded from the first rounds of MDA for fear of using Albendazole. Although the policy was later reversed prior to the third round of treatment, leaving a lasting effect on the women who continued to have low compliance rates (Talbot *et al.*, 2008). Other reasons cited for the low first time MDA compliance rates among the females in Haiti were fear of taking the drug while on contraceptives and to avoid the embarrassment of being asked if they are pregnant during the treatment day (Krentel *et al.*, 2013). Age has also been associated with MDA non-compliance in the past. In Ghana and Haiti, individuals aged 15 – 34 and 16 – 30 respectively were reported to be systematic MDA non-compliers (Gyapong *et al.*, 2008). While in Papua New Guinea, the younger generation was increasingly becoming resistant to continuing compliance in some areas, because they thought that LF was no longer a threat to them (Wynd *et al.*, 2007). Misconceptions and misinformation about the treatment, prevalence rate of the disease in the areas of residence, area of residence (rural/urban) and household income of families in targeted communities have also been reported to influence first time MDA compliance levels (Krentel *et al.*, 2013). In the Philippines, Tanzania, Kenya and Vanuatu, first time MDAs suffered due to treatment misconceptions since people believed the MDA drugs were contraceptives aimed at controlling their population. However, uptake of consecutive MDAs increased after these misconceptions were addressed (Fraser *et al.*, 2005; Wamae *et al.*, 2006; Amarillo *et al.*, 2008; Mackenzie *et al.*, 2009). Studies have also reported living in rural environment to be associated with high first time MDA compliance level as opposed to coming from an urban area (Babu and Kar 2004; Ramaiah *et al.*, 2006; Nujum 2011; Gunawardena *et al.*, 2007b). This is because in the urban areas, there are fewer health workers and volunteers (Babu *et al.*, 2006; Gunawardena *et al.*, 2007b), there is dominance of private health care providers (Babu and Mishra 2008; Ramaiah *et al.*, 2005), and presence of unorganized settlements and large number of migrants (Ramaiah *et al.*, 2005). Individual with lower incomes have been reported to be more receptive to MDAs unlike those with higher incomes, who are difficult not only to reach but also to convince to take the medications (Ramaiah *et al.*, 2005; Nandha *et al.*, 2007; Njomo *et al.*, 2010). However, it is not known whether there are other community specific factors associated with a first time MDA especially in schools. Hence the need to document other community specific factors that may influence compliance in first time MDAs in schools.

2.6 Conceptual Framework

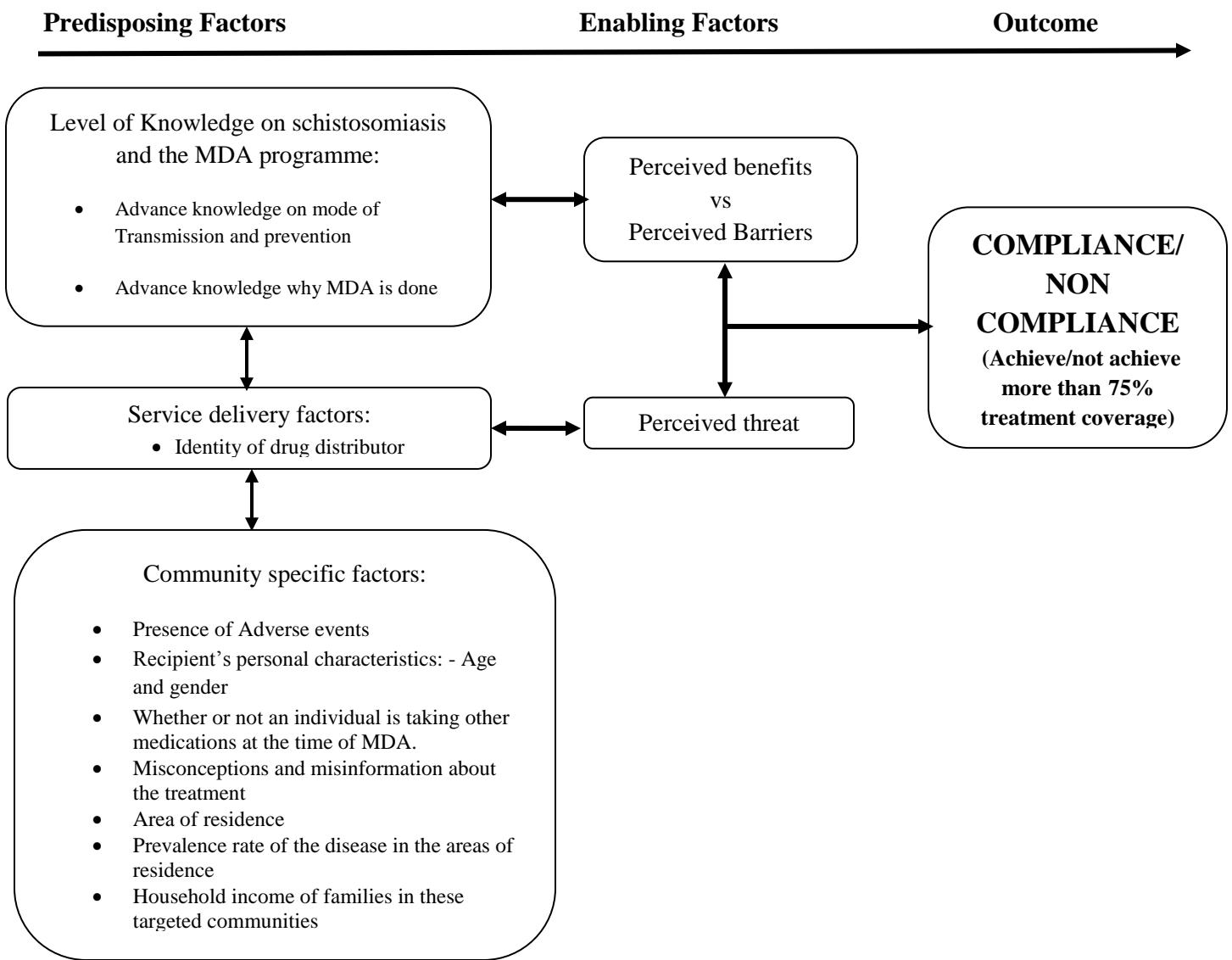


Figure 2.1 Adopted and modified from (Glanz *et al.*, 2002)

The conceptual framework was adapted from that of the health belief model which states that, a person's willingness to change his/her health behavior is primarily due to: ones **perceived susceptibility** (i.e. people will not change their health behaviors unless they believe that they are at risk), **perceived severity** (i.e. The probability that a person will change his/her health behaviors to avoid a consequence depends on how serious he or she considers the consequence to be) **perceived benefits** (i.e. It's difficult to convince people to change a behavior if there isn't

something in it for them.) and **perceived barriers** (i.e. one of the major reasons people don't change their health behaviors is that they think that doing so is going to be hard i.e. physical/social difficulty). The health belief model also consists of the predisposing variables, which include the level of knowledge on schistosomiasis and the MDA programme, service delivery factors and the community specific factors. These can affect perceptions (i.e. perceived seriousness, susceptibility, benefits and barriers) of health related behaviors indirectly.

The health belief model was applied as shown in table 2.1 below.

Table 2.1: Application of the Health belief model concepts

Concept	Application
Perceived susceptibility and perceived severity	Assessed through ones level of knowledge of the disease and the MDA program. i.e. By one being knowledgeable of the disease, one is able to perceive whether he/she is susceptible to the disease hence also assess the seriousness of the disease. With these two factors, one will be able to determine the perceived threat he/she is faced with, hence choose to either or not to take part in the MDA
Perceived benefits	What are the benefits associated with the MDA?
Perceived barriers	What are the factors for Non-compliance in school?
Predisposing factors	How does the level of knowledge on schistosomiasis and the MDA programme, Service delivery factors, and community specific factors influence MDA compliance?

CHAPTER THREE

MATERIALS AND METHODS

3.1. Study Area

The study covered all eight sub-Counties along the shores of Lake Victoria i.e.; Bondo, Rarieda, Kisumu Rural, Kisumu East, Nyando, Rachuonyo North and South, and Homa Bay. As shown in Figure 3.1 below, these sub-Counties, all in former Nyanza province, are endemic for schistosomiasis. These sub-Counties are mainly inhabited by the Luo ethnic community and the main economic activity in the region is fishing. It has a total population of approximately 5,442,411 people (2009 census) and covers approximately 12,613 km². It is located between 0°30'S and 34°40'E. All residents in the area are at risk of infection with schistosomiasis, due to frequent water contact with the lake which is the main source of transmission. No praziquantel MDA activities had been conducted in the area prior to 2011 when the SCORE study was initiated.

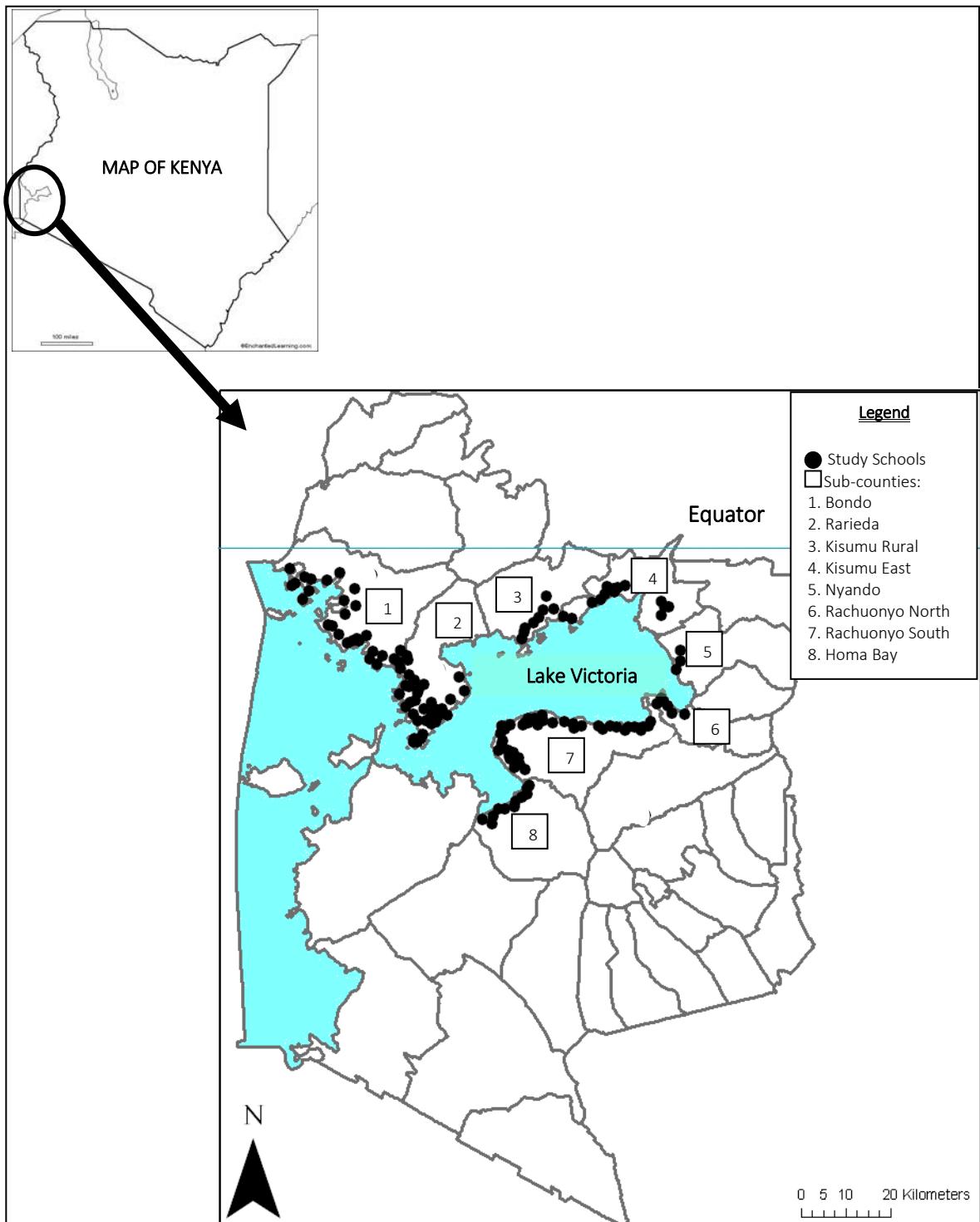


Figure 3.1: This map shows the sub-Counties that were covered in the study

3.2 Study Population:

The study population consisted of primary school health teachers and pupils (aged 12 – 17 years), whose schools took part in the MDA exercise in 2011. Of these, 36 schools were from high disease prevalent areas and the other 39 from moderate disease prevalent areas (WHO, 2011) as shown in table 3.1 below.

Table 3.1: Prevalence and distribution of schistosomiasis in schools and their population

District	Schools with prevalence ≥25% to < 50%			Schools with prevalence ≥ 50%		
	School	Prevalence	Population	School	Prevalence	Population
Rarieda	Mumbo	40.7	70	Mirau	87.5	211
	Ogango	40.0	48	Wambisa	86.8	142
	Rabel	31.3	138	Nyakongo	79.6	138
	Komolo	26.0	102	Kadundo	77.5	151
				Nyaondo	71.4	94
				Kagwa	63.0	210
				Akuom	62.2	133
				Agok	62.1	169
				Ndonyo	56.3	105
				Manywanda	53.1	137
Bondo	Sinyanya	41.7	90	Bar Awendo	97.0	109
				Kanyibok	93.7	305
				Pala	88.5	302
				Mbekka	79.7	308
				Usenge	78.4	396
				Miyandhe	77.8	76
				Lenya	76.6	112
				Minya	71.1	168
				Uhendo	71.1	101
				Nyaguda	66.7	269
				Nyamonye	64.3	213
				Dago	64.0	141
				Migiro	62.5	101
Kisumu West	Abol	44.4	98			
	Olare	31.8	38			
	Rodi	26.9	158			
	Kajulu	26.7	159			
	Oruga	26.0	168			
Kisumu municipality	Gongo	45.0	111			
	Lisuka	40.8	171			
	Usari	31.9	215			
	Ogal	31.0	223			
	Kotetni	30.2	289			
	Tieng're	26.7	339			

	Ngege	26.1	104			
Kisumu East	Nyalunya	34.4	236	Odiensa	56.8	156
	Nyamasaria	26.0	160			
Nyakach	Nyadina	45.2	221	Obange	72.2	232
	Sangoburu	37.5	144			
Rachuonyo	Kasibos	45.0	102	Seka DOH	71.0	139
	Chula	42.5	158	King'ii	70.6	113
	Lo-rateng'	41.5	136	Ndere	68.0	136
	Onyando	39.4	99	Maguti	61.0	120
	Kanam	38.3	128	Kisindi	58.1	134
	Kotieno gumba	37.8	156	Jonyo	57.8	151
	Kogweno	33.0	260	Mirembe	57.0	148
	Rabuor koguta	31.3	143	Abundu	51.5	131
	Kagayi	29.4	160	St. Douglus,Weta	50.9	181
	Homa lime	29.4	83	Kanyang'wena	50.0	124
	Migeni	26.0	115			
	Migunde	26.0	135			
Homa bay	Lala	42.1	223			
	Got Rabuor	38.9	125			
	Kuoyo kochia	34.7	145			
	Kuoyo kaura	31.5	138			
	Pedo	28.6	220			
	Lake	26.3	449			
Total pupil population (Classes 4 to 8)				12,113		

3.2.1 Inclusion criteria

Those who took part in the study included;

- Primary health teachers whose schools took part in the MDA activity.
- Pupils (between the ages of 12 and 17) whose schools participated in the MDA exercise and were either found in high or moderate disease prevalent areas.
- Pupils with properly filled consent forms.

3.2.2 Exclusion criteria

Those disqualified from taking part in the study included;

- Pupils (between the ages of 12 and 17) with poorly filled consent forms, whose schools took part in the MDA exercise.

3.3 Study Design

This was a cross-sectional study that involved two study populations i.e. primary school health teachers and the primary school pupils. Using stratified random sampling technique, all public primary schools (200 schools), within a 5 km radius from the shores of Lake Victoria, were randomized with stratification by prevalence of *S. mansoni* infection on screening, using the Kato Katz technique (appendix 4). From this, all schools with a prevalence of $\geq 25\%$ were recruited into the study and thereafter all their health teachers purposively recruited.

Using systematic sampling technique, a list of all the 12,113 pupils was made and from that list, 411 pupils selected using the formula RS; RS+SI; RS+2SI; RS+3SI and so on up to the 411th pupil. The Random Start (RS) was determined by randomly choosing a number between 1 and 27 (the sampling interval). In this case, the 20th pupil was randomly chosen as RS.

The sampling interval (SI) was determined by dividing the total number of pupils (12,113) by the new sample size (411), which was determined as shown below.

3.4 Sample Size Determination

The sample size (ss) was determined using the finite population formula, for populations above 50,000 (Fisher *et al.*, 1998).

I.e. *New ss = ss/ 1+ [(ss-1)/N]* from $ss = [Z^2 * (p) * (1-p)] / c^2$ (finite formula for populations above 50,000) where;

ss = Sample size,

Z = Z-value (1.96 at 95% confidence level),

p = Percentage of population picking a choice, expressed as a decimal,

c = confidence interval expressed as a decimal and

N = 12,113 (Population size).

i.e. $ss = [1.96^2 * 0.5 * (1-0.5)] / (0.05)^2 = 384.16$ (rounded off to 385)

New ss = $385/1+ [(385-1)/12,113] = 373.1699607$ (rounded off to 373)

Therefore, new ss = 373 + 38 (10% non-response rate) = 411

The total population of the schools (N) was determined from the school inventories which were collected from the school's class registers. The sample size for each school was determined using the proportionate to size formula: $n_h = (N_h/N) * n$ where;

n_h = sample size for each school, N_h = Population of pupils in each target school as per the school inventory, N = total population size (12,113) and n = total sample size required(411).

Health teachers: The health teachers were purposively recruited in the study since all of them took part in the MDA activities.

3.5 Sampling Technique

Both purposive and systematic sampling techniques were used respectively, in selecting both the health teachers and the pupils who were included in the study.

3.6 Recruitment and Training of Research Assistants

A total of ten research assistants were recruited to assist with both the consenting process and data collection, which took a period of one month under the supervision of the principal investigator. The research assistants were drawn from people living within the community who met the following qualifications:-

- Secondary school level of education preferably with a training background in social work.
- Aged between 18 and 35 years.
- Able to speak English, Swahili, and Dholuo languages
- Available throughout the consenting and data collection period.

The selected persons underwent a one week training in which they were trained on the study protocol. Areas of focus included; the background, purpose and the objective of the study, the sample population, study location and the consenting process (for both the minors and the health teachers) and the data collection process. The training also included other basic principles of data

collection such as how to establish rapport with respondents, checking through completed questionnaires to identify errors and omissions and how to handle complete instruments to avoid loss or misplacement. After going through all this, the research assistants were then given time to practice the use of the instruments on each other.

To consent the minors, the research assistants were instructed to first issue them with letters asking their parents to come to school the following day. Both the pupils and their parents would then be given a brief background, purpose and the objective of the study and thereafter those willing to take part in the study, consented (see appendix 1 for a copy of the informed consent form). After the consenting process, the pupils were then issued with the questionnaires and guided through.

3.7 Pre-testing of Data Collection Instruments

Pre-testing of the data collection tools was done one week after the training of the research assistants to validate the data collection tools and also confirm their reliability. The questionnaire (appendix 2) was pre-tested at Kisian primary school whereas the structured group interview guide (appendix 3) was pretested among 8 health teachers from Mbita sub-county. Both pupils from Kisian primary and the 8 health teachers from Mbita sub-county did not form part of our study population.

3.8 Data Collection Tools

The research data was collected through structured open ended questionnaires (for the pupils) and structured group interviews (for the health teachers), whose main themes for discussion were as per the specific objectives.

3.9 Data Collection Procedure

Structured interviews: Since it is assumed that, children aged 12 – 17 years are able to express themselves, structured questionnaire was conducted amongst these respondents. The main theme of the questionnaire was focused on the level of knowledge on schistosomiasis and the programme, and the perceived benefits associated with the MDA exercise. Each interview was conducted in either English or the local language (dholuo). Since retrospective studies had limitations concerning recall bias, in order to prompt the respondents' memory, respondents were

shown both the MDA tablets and the treatment tape when asked whether they participated in the MDA exercise.

Group discussions: Group discussions amongst health teachers was conducted in English and the main themes for discussion were on level of knowledge and awareness about schistosomiasis and the program, the perceptions of the health teachers on the role of a health teacher as a drug distributor and the factors for non-compliance to the MDA exercise. A total of eight group interviews (one per district) were conducted and each interview took between 45 – 90 minutes.

3.10 Data Entry and Analysis

Qualitative data was transcribed verbatim and the transcripts then grouped into themes before being analyzed using ATLAS t.i. qualitative data analysis software (Berlin, Germany). Quantitative data was analyzed using SPSS version 16.0 software, from which categorical data was analyzed using bivariate analysis where an association between all potential exposure variables (age, gender, prevalence rate of the disease in areas of residence, knowledge on schistosomiasis and the perceived benefits associated with the MDA exercise) and Non - compliance (outcome of interest) was made. All the significant variables from the bivariate analysis (appendix 6) were then subjected to a multivariate analysis using linear logistic regression, to identify the independent predictors of Non-compliance with praziquantel following MDA. Both stepwise forward and backward elimination methods were used to enhance the robustness of the model. All p-values ≤ 0.05 were taken as significant.

3.11 Ethical Considerations

The study was reviewed and approved by the Kenya Medical Research Institute Ethics Review Committee (See appendix 5). Participation in the study was also out of free will and anyone was free to drop out of the study at any time, without being penalized.

3.12 Limitations of the Study

The study used health teachers to obtain the views of the community. This limitation was managed by use of group discussions which was used to capture common themes from the discussions.

CHAPTER FOUR

RESULTS

4.1 Demographic Characteristics of the Study Population

A total of 411 pupils with a median age of 14 took part in the study, with 37 of them being non-compliant. Females accounted for 50.4% (207 pupils) of the total population surveyed, while the males accounted for 49.6% (204 pupils) of the total. 9% (37 pupils) of the population surveyed were MDA non-compliant with 6.3% aged 12-14 years and 2.7% aged 15-17 years old. 3.6% of those who were non-compliant were girls (15 pupils) while 5.4% (22 pupils) were boys as indicated in Table 4.1 below.

Table 4.1: Demographic characteristics of the study population

Variable	Frequency (n = 37)	Percentage (%)
Age group (years)		
12 - 14	26	6.3
15 - 17	11	2.7
Sex		
Female	15	3.6
Male	22	5.4

4.2 Level of Knowledge on Schistosomiasis and the MDA Programme amongst the School Going Children Aged 12-17 Years and their Health Teachers

Knowledge on the MDA programme (knowing the reasons for swallowing the drug) and knowledge of the disease (Have you ever heard of schistosomiasis?) were the strongest predictors of non-compliance. i.e. The odds of being MDA non – compliant were significantly increased for those pupils who didn't know the reasons for swallowing the drug (AOR = 22.665, 95% CI = 5.187 – 99.040, $p \leq 0.001$), as well as for those who had never heard of schistosomiasis (AOR = 12.345, 95% CI = 3.729 – 40.871, $p \leq 0.001$) respectively as shown in table 4.2.

Table 4.2: Binary Logistic regression analysis for factors contributing to non-compliance amongst primary school aged pupils

Questionnaire variable	Non-compliant		Adjusted Odds ratio (95% CI)	p value	
	(n = 37)				
Perceived benefits associated with the MDA programme					
Do you know the reasons for swallowing drug?	No	35	8.5	22.665(5.187–99.040) 1.00 (Ref)	
	Yes†	2	0.5		
Knowledge of disease and programme					
Have you ever heard of schistosomiasis?	No	7	1.7	12.345(3.729–40.871) 1.00 (Ref)	
	Yes†	30	7.3		

Only explanatory variables that have shown a significant difference in the descriptive statistics were included. CI- confidence interval, Ref- Reference, † Reference group

Most of the health teachers declared having heard about schistosomiasis before, since they all come from the lake region. Even though most of them didn't know how schistosomiasis was transmitted, they knew that it was a water borne disease and therefore thought it could be got by drinking contaminated water. Some of the health teachers also stated that schistosomiasis could be transmitted through eating contaminated meat, unwashed fruits or even eating using unclean hands (Text box 1).

Text box 1: Knowledge on schistosomiasis amongst health teachers:

Theme	Quotes
Awareness on schistosomiasis	<p><i>"Yes, I have heard of bilharzia. It is a very common disease in our area, since I am coming from the lake..."</i> (Male Health teacher, Bondo)</p> <p><i>"Yes, I have heard of it, from the fact that I come from or closer to the lake shore, this is a common disease around."</i> (Male Health teacher, Rarieda)</p> <p><i>"I have also heard of it the way my colleagues have talked about it and to add on it, it is a disease that you can get from water. It is a water borne disease, and am also coming from around the lake so people do talk about it"</i> (Male health teacher, Rarieda)</p> <p><i>"Am from Buru primary school, and I have heard of bilharzia. It is water borne disease and in fact it is there in the class 6 syllabus."</i> (Female health teacher, Rarieda)</p> <p><i>"... actually my school is 2 meters from the lake. And before I got tested, I used to hear of bilharzia but I had not seen anybody suffering from it but actually this time, I actually got an opportunity to see how it affects people. It is water borne disease..."</i> (Female health teacher, Rarieda)</p>
Knowledge on transmission	<p><i>"One can get bilharzia, when he is walking in stagnated fresh water. Because the bilharzia worms are found in the snail in fresh water, that is stagnated. So when one works in fresh water, swims in fresh water or bathes or even walks on it, one can get bilharzia infection."</i> (Male science health teacher, Rachuonyo)</p> <p><i>"...okey it comes through water maybe when an infected person defecates maybe then the feces are transferred to water, let's say by erosion. Then the eggs will have to multiply let's say...the snails will hatch the eggs, the eggs will also develop into another stage and enter through the body let's say through the skin, through the openings and then it affects the body."</i> (Male science health teacher, Kisumu East)</p> <p><i>"Its water borne disease and we have two types of bilharzia. There is the bilharzia of the intestines and the bilharzia of the bladder. Bilharzia of the bladder is characterized by passing blood stained urine, and then the intestine is characterized by passing out stool stained with blood. So bilharzia, germs live in a snail that stays in fresh water. Then after sometimes, it hatches into a larva which will finally leave the snail ready to attack anybody who gets into that water. Then the germ gets into the body through the skin. Bilharzia is a fatal disease and it kills when not treated in good time."</i> (Male science health teacher, Rachuonyo)</p> <p><i>"I think it is an infection brought by worms carried by snails brought by stagnant water. Mainly by lakes and maybe ponds."</i> (Female social studies Health teacher, Rarieda)</p> <p><i>"It spreads faster because sometimes you may have a lot of stagnant water and some people even do not have latrines and some kids are just walking bare footed. So mostly the snails can spread this, and even in some cases like we, some people are using water for bathing, but they urinate in water and this germs can sometimes go direct to their stomach and more so it brings this liver cirrhosis disease..."</i> (Male mathematics Health teacher, Homabay)</p> <p><i>"It is transmitted more so by worms, carried by snails and passed on via water. So the</i></p>

	<p><i>germs themselves enter through the skin, to the intestines and more so the liver.”</i> (Male science health teacher, Rarieda)</p> <p><i>“Another way we can get bilharzia is if we do not cook well the food that we eat, like the fruits, if we do not wash them well, we can get bilharzia. The egg can be in us and when we excrete, we excrete in water and continue to drink water that is not treated. We can continue getting bilharzia.”</i> (Female social studies health teacher, Rachuonyo) [Some of the other teachers seem to agree with the statement by nodding their heads, while teacher no 4, 6, 8 and 9 (all class 6 science teachers) disagrees with the statement.]</p>
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Majority of the health teachers also felt they were at risk of schistosomiasis infection. Amongst the reasons given for this included: taking part in domestic chores which involved getting into contact with contaminated water from the lake, bathing in the lake, lack of latrines in the community and lastly, participating in occupations that exposed them to schistosomiasis infection. The health teachers also mentioned “drinking contaminated water” (Text box 2).

Text box 2: Susceptibility to schistosomiasis infection

Theme	Quotes
Susceptibility to schistosomiasis infection	<p><i>“Am at risk, because me as a mama (woman), am always in water and I can sometimes walk bare footed and the people who are surrounding me, are not bilharzia free, ...And even the children we are teaching, some of them might have that disease in them but they don’t know as we have said, this thing lives in water and immediately we get contact in water, we can get bilharzia so am still not bilharzia free.”</i> (Female health teacher, Rachuonyo)</p> <p><i>“What I can say is that, yes am at risk of getting bilharzia, because basically bilharzia worms are spread when the community does not use toilets. So as long as people living around me do not use toilets, when they go for urinating in fresh water, am still at risk of getting bilharzia. If only that is washed to the lake, I bathe in the lake; I wash with lake water, am at risk of getting bilharzia.”</i> (Male health teacher, Rarieda)</p> <p><i>“... I can say am at risk because number one, there are no toilets around that place, except the ones in the school. Secondly, nearly all the children are walking bare footed, they bath in the lake, and their hygiene at home is not that up to standard.”</i> (Female health teacher, Rarieda)</p> <p><i>“....In fact where I come from, you know along the lake shore there is a high risk of</i></p>

getting bilharzia because every morning especially the old people, go to the lake sometime to the stagnant water and even their kids play in the stagnant water though the water is fresh but and again they use it for drinking. So they are at a higher risk.” (**Male health teacher, Rarieda**)

“yes, we are at risk of getting such disease because: one, as much as I may be having a latrine, my neighbor may not be having one and maybe just be using the bushes and as we had said, the feaces around may be carriers to what we are talking about. Likewise the water that we are using, as a colleague had said, this water should be treated for drinking and you find that in our region, majority take water direct from the pond or the river for consumption. Leave alone even preparing anything, it is drown from there, open up the mouth and drink. Yah! So we are at high risk of getting bilharzia.” (**Male health teacher, Rarieda**)

“We are because sometimes you know....most of us, are not well equipped with jobs. Some people just earn their living through washing cars, washing things and it is the same lake we are using for drinking, washing everything and for bathing. So we are at high risk of this disease” (**Male health teacher, Kisumu west**)

“I do. Why am I saying this? There is a word from the bible, I don’t know exactly where it comes, but people do believe that water is blessed as from the time of God as it was given. And so people do take it without boiling it. Just as my colleague had said, lake water looks clear but it isn’t clean. So they believe whatever is clear, is clean. So those two words are confusing. Next to that, being a person from the lake, I may double up as a fisherman, and you always know what fishermen do. Once I am right inside, there are no “structures” there. The only structures I see is the surface water. And the same, same water that I have used as my latrine, I move some few distance and feel thirsty, I will also be tempted to retake it. [Fellow participants concur with p4]So I infect myself as well as other people around me. ...Yah, so am at risk though I may have all the requirements, I may do all the need full. But if my people around, are not taking care of themselves, as well as others, I am still at risk.” (**Male health teacher, Bondo**)

“Yes, I would also say that am at risk because of many reasons that my colleagues have said but I can only add that as much as maybe have known that this thing is got from water so I may intend not to go and bathe in the lake. But this water will be collected from the lake and brought home. And because I believe that if I bathe with warm water I will be weak, this water will just be given to me and I bathe. And you see this thing gets into the body through the skin and therefore I will also get it.” (**Male health teacher, Rarieda**)

The health teachers mentioned various ways of controlling and preventing bilharzia infection. Among those mentioned included: promoting latrine use, taking part in MDA activities, not bathing in contaminated lakes, boiling lake water before bathing and use of protective clothing like gumboots while working in stagnant water. However, some of the health teachers thought one could prevent bilharzia infection by; putting on shoes in contaminated areas (latrines), eating well cooked meat and well washed fruits, proper hand washing with soap and

water after visiting the latrines and before eating. More than half of the health teachers also mentioned “drinking clean treated water” as a way of controlling for schistosomiasis infection (Text box 3).

Text box 3: Awareness of control and prevention measures

Theme	Quotes
Control and prevention measures	<p>“... one is creating awareness on latrines. People around me or the community having latrines. Secondly, we have to take drugs to at least reduce the bilharzia worm such that maybe in the near future, everybody can be bilharzia free. Thirdly, we have to take care of the general hygiene such that everything we use, the water we drink, the water we use for domestic use must be clean and treated. Since we said that this disease is water borne, we find that most of our activities usually people living around the lake region if not regions like Ahero where they carry out the activity of rice growing, we should use protective devices like gumboots, gloves so that we reduce our contact with the contaminated water. Then also instead of having bathrooms right inside water, we should at least erect some shifts [shelter] ... and maybe use boiled water that will have killed the germs before we use it for bathing.”</p> <p>(Male health teacher, Bondo)</p> <p>“... I'll be aware that every water that I am drinking is treated ...” (Male health teacher,)</p> <p>“As a health teacher, in the school we have provided water and soap for washing hands at different times when the pupils are from the toilet. Then we encourage them to carry their own water from home for drinking.” (Female Health teacher, Rarieda)</p> <p>“One, I need to drink treated water, clean treated water, 2nd thing, I need not to walk bare footed and I will advice those around me to do the same, and I will also advice those who are eating the meat, to cook them well because some of the eggs stay inside. So the food should be cooked well and when we are suppose to eat the fruits, let us wash them well with clean water and when we want to eat, let us wash our hands with clean water and soap.” (Female health teacher, Rachuonyo)</p> <p>“It can be cured if one follows the instructions of the physician, take the drugs and you avoid walking in dirty water, avoid drinking dirty water”(Female Health teacher, Rarieda)</p> <p>“The toilets should be used well and have containers for washing hands after coming from the toilets.”(Male health teacher, Rarieda)</p>

4.3 Perception of the Community as Reported by the Health Teacher, on the Health Teacher's role, as a Drug Distributor

The teachers reported that, majority of the parents did not like the idea of “just mere teachers” being given drugs by the government to treat their children. However, a few of them supported the idea since they (parents) had trust in them (Text box 4).

Text box 4: Perceptions of the community on the role of the health teacher as a drug distributor

Theme	Quotes
Teacher reported perception of the community on the role of a health teacher, as a drug distributor	<p><i>“What I wanted to say is that, teachers are known by the community and the villagers... So when the teachers give the information of maybe about the drug, they [parents] may not take it negatively. They will say for first, it is the teacher who has said. They [parents] respect the teachers and once they've respected the teachers, so they take in whatever the teachers have told them. And if they are given reports, they also accept the same.”</i>(Male Health teacher, Rarieda)</p> <p><i>“These people [parents] really respect teachers. And they always take what a teacher says to be right. And they know a teacher cannot give what is wrong to a child. So once we have announced that we will be having what? Deworming! And you first of all motivate them by giving them the importance of such an exercise. So when the pupils come the next day, they are so much charged to have the medication. So it [MDA] has always been successful.”</i> (Male Health teacher, Rarieda)</p> <p><i>“It is so sad even some parents were saying that, the work of the teacher is not to administer drugs, because he has no know how on drug dosage. There is this question, “when did you become a doctor.” They were asking.”</i>(Male Health teacher, Rachuonyo)</p> <p><i>“Some parents do not understand and given the drugs were given by teachers they know we're not qualified on the same, because they do not believe teachers underwent such a seminar and at least have known how it [treatment] should be done and the reactions we expected.... they still felt something was still missing. I don't know how such parents can be dealt with. ...it could be better, if it can be possible that during dispensing time, [MDA] an officer from your office comes and either when the teachers do it, they do it in your presence, so that we can say, the doctor was there.”</i>(Male Health teacher, Rachuonyo)</p> <p><i>“They [parents] were now cross with us telling us that “you know you are teachers and not medics.” So this one in fact when you leave us to go and sensitize, let us go and sensitize the staff members, but when it comes to sensitizing pupils and even the community around, let one of you be with the teachers, so that they [parents] be much more convinced”</i>(Male Health teacher, Nyakach)</p> <p><i>“... there were two parents who almost fought me because I gave their pupils the drugs. And they warned me that, “you should never do that again.” So I had to “shrink” because it was an embarrassment before the pupils.”</i>(Male Health teacher, Bondo)</p>

4.4 Perceived Benefits Associated with the MDA Exercise

Majority of the health teachers perceived a reduction in absenteeism amongst the pupils, as one of the benefits associated with the MDA exercise.

“...absenteeism in general has improved because this time round the children attend school regularly as opposed to before the drug taking was introduced” (Male health teacher, Rarieda District)

They also noted an improvement in the general health status of the pupils.

“Otherwise I want to thank you so much because from the time the drugs were administered to date, these cases of children mara dakika kidogo (after sometime), “teacher am feeling sick, I want to go home, tumbo inaniuma (I have a stomachache),” the rate has reduced.” (Female Health teacher, Kisumu Municipality)

4.5 Other Community Specific factors associated with MDA Non-compliance

Some of the other factors associated with MDA non-compliance, included: fear of adverse events, fear of the drug because of its size and dosage, cost of treatment in case of a referral due to adverse reactions and the perceived “benefit” the other teachers associated with the MDA exercise.

Because of the different school calendars, schools didn’t treat on the same day hence the side effects experienced by pupils from neighboring schools made some of the pupils to stay away from school during the different treatment periods.

In addition, the health teachers also reported that most of the parents were not comfortable with the treatments due to the side effects experienced from the MDA drugs. It was also reported that some of the pupils kept away from school during treatment days for fear of the drugs because of their sizes and the dosage.

Majority of the health teachers noted that their fellow teachers were not ready to assist them with the treatment exercise in schools, since they believed that the health teachers were

paid to do the exercise and therefore, if they were to assist, then they would need “something” in return.

Finally, some of the parents and the health teachers were not ready to play their respective roles during the MDA process for fear of meeting the referral treatment costs, resulting from the treatment side effects as illustrated in text box 5.

Text box 5: Other community specific factors associated with MDA non-compliance

Theme	Quotes
Fear of adverse events	<p><i>“During the time we were treating, some of our neighboring schools within the district had treated hence the side effects experienced by some of the pupils there, made our pupils not to come to school, when we told them that we were going to treat them for bilharzia”</i> (Male Health teacher, Bondo district)</p> <p><i>“Like for the case of bilharzia treatment..... it was a challenge to us because of the side effects. Side effects were so many such that when the ministry came with albendazole, just some three weeks ago to administer, parents came to school to know whether they were going to administer “that drug” again? Then we told them no, this one (mebendazole) is a regular deworming. The other one has not come. So they fear bilharzia drugs. They fear that!”</i> (Male health teacher, Rarieda district)</p>
Fear of the drug because of its size and dosage	<p><i>“But one serious challenge that I saw this time was, chronic absenteeism on that particular day, especially for the standard 7 and 8s. So maybe I suppose that their absenteeism was just due to the attitude they had towards the drug that is towards the size of the drug and maybe the dosage that is given.”</i> (Male health teacher, Nyakach district)</p>
Fellow teachers’ perception of the MDA exercise	<p><i>“A teacher will not leave his or her work to come and help you, knowing that, when you were called for the seminar, you were given something (money). So if you tell the teacher to come and help you, he or she will come expecting something at the end. So we went as far as using our money to make the exercise successful.”</i> (Male health teacher, Rachuonyo district)</p>
Fear of meeting treatment referral costs	<p><i>“Now she [the pupil’s mother] was saying that the first time, the child was given the medicine, she complained of stomach problem. Then she was saying that, that thing lasted for some time. Then that thing really disturbed her and she had to take the child to the hospital. So she feared that if that thing is going to be given again, who will meet the expense?”</i> (Male health teacher, Bondo district)</p> <p><i>“My concern is a case of referring a child. You know, we were giving an okey for the parent to take the child to the hospital. And the parent was talking of maybe the distance from the hospital to the school. They were saying, “Who is going to pay the bill and the transport which is taking this child to the hospital?” So, I as a teacher, it forced me to pay maybe the transport and some of the hospital bills, to treat the child.”</i> (Male health teacher, Rarieda district)</p>

CHAPTER FIVE

DISCUSSION

5.1 Level of Knowledge on Schistosomiasis and the MDA Programme amongst the School Going Children Aged 12-17 Years and their Health Teachers.

Low level of knowledge on schistosomiasis and MDA program amongst the pupils were the strongest predictors of non-compliance. This finding is in line with LF studies conducted in India, Sri Lanka, Haiti, and Kenya, which suggested that knowing the source of transmission for LF, knowing that MDA protects against LF and that MDA was for LF in advance, greatly increased the levels of compliance amongst participants (Gunawardena *et al.*, 2007a; Babu & Mishra, 2008; Cantey *et al.*, 2010a; Cantey *et al.*, 2010b; Njomo *et al.*, 2012). This finding is also in agreement with schistosomiasis studies conducted in Uganda, Ghana and the Philippines, which proposed that, lack of knowledge about schistosomiasis transmission and prevention, inadequate health education and drug shortages were some of the major factors associated with low MDA compliance (Nsowah *et al.*, 2001; Amarillo *et al.*, 2008; Muhamuza *et al.*, 2013; Tuhebwe *et al.*, 2015).

The study also revealed that most of the health teachers, who taught science as a subject, were more knowledgeable and aware of schistosomiasis, than their counterparts who taught other subjects. This difference in knowledge levels amongst the health teachers could have contributed to the low level of knowledge on schistosomiasis and the program amongst the pupils, leading to MDA non compliance in schools, since the non-science teachers, may not have been able to offer adequate health education to address the fears of their pupils. This finding is in harmony with that of Njomo *et al.*, (2012) which showed that the content of MDA information received had an influence on compliance. Hence for MDA to be successful in school, information dissemination should be done by the health teachers with the health personnel taking the lead in terms of supervision so that more adequate and factual information is passed to the pupils. The sensitization should be done repeatedly to ensure the pupils get the information in good time in readiness for the MDA.

5.2 Perception of the Community as Reported by the Health Teacher, on the Health Teachers' role, as a Drug Distributor

The study showed that the health teachers felt most parents lacked confidence on the role they played as drug distributors. The health teachers noted that this was because many parents were not involved in pre-MDA sensitization. According to Krentel *et al.*, (2013), the identity of the drug distributor is consistently linked to MDA compliance and therefore during pre-MDA sensitization, there is need to select a drug distributor that is known to the community and with credentials to indicate that he or she can be trusted. To ensure this, drug distributors could be recommended by schools through groups such as the parent-teacher associations (PTA) and on completion of training on MDA, issued with a certificate of competency. In addition, previous studies from India, the Philippines and Samoa have shown that health personnel supervision positively influenced MDA compliance; hence there is need for such supervisions to be organized during MDAs (Ramaiah *et al.*, 2001; Amarillo *et al.*, 2008; Hayley *et al.*, 2010; Mahalakshmy *et al.*, 2010; Nujum, 2011; Patel, 2012). Such supervisions can be done by health personnel from the nearby health facilities.

5.3 Perceived Benefits Associated with the MDA exercise

Ninety two point two percent of the pupils were able to personalize the benefits of the MDA to their own health hence leaving the other seven point eight percent non-compliant thus able to act as future reservoirs for infection. This finding is in agreement with studies conducted in Haiti, India and the Philippines. In these studies, those who were unable to personalize the benefits of the MDA for their own individual health were also less likely to comply with MDA activities thus posing a risk for future infections (Babu & Satyanarayana, 2003a; Babu & Kar, 2004; Nandha *et al.*, 2007; Amarillo *et al.*, 2008; Babu & Mishra, 2008; Talbot *et al.*, 2008; Aswathy *et al.*, 2009). Hence to create awareness on the perceived benefits of treatment, there is need for the pupils to be sensitized on the treatment drug and its side effects. However, the acknowledgement of “the improvement in school attendance and that of the pupils’ “general health” to the MDA exercise by a majority of the health teachers, was seen to have a positive influence on future MDAs in the same community.

5.4 Other Community Specific Factors Associated with MDA Non-compliance

Other community specific factors that might have contributed to MDA non-compliance included: the fear of adverse side effects, and fear of the drug size and dosage. These findings concur with those from India, Kenya, Philippines, Sri Lanka, Uganda and Vanuatu. In these studies, the potential for adverse events following MDA was responsible for discouraging as well as encouraging compliance (Babu & Kar, 2004; Ramaiah *et al.*, 2006; Canney, 2010a; Canney, 2010b; Karmakar *et al.*, 2011; Nujum, 2011; Parker & Allen, 2011). These studies also found that the large number of pills to be swallowed had the highest contribution to MDA non-compliance, followed by complaints about the size, smell and taste of the tablets (Babu, 2003a; Fraser *et al.*, 2005; Ramaiah *et al.*, 2006; Njomo *et al.*, 2010).

From the study, health teachers expressed concern that most of the parents and the school administration feared participating in the MDA, for fear of being responsible of meeting any treatment costs that would arise as a result of the adverse side effects experienced by the pupils. This finding resonated well with one from Ghana, in which parents strongly complained to the government for not wanting to meet the cost of referrals that resulted from an MDA exercise (Brooker *et al.*, 2001).

The study also noted that other teachers were not ready to assist their colleagues (the health teachers) with the treatment exercise. These other teachers believed that the health teachers, who had been taken for MDA training, were being paid to do the work and therefore the MDA should have been their sole responsibility. This perception made some of the health teachers not to appreciate their role as drug distributors since the drug distribution which involved mobilizing pupils, preparing porridge (snack for the pupils before treatment with praziquantel), giving drugs, and collecting unused tablets, along with monitoring the pupils for any adverse events was noted to be very tedious. This also contributed to the health teachers not being able to trace all the pupils for treatment, hence compromising coverage levels. This finding is in line with studies which stressed the need for team work so as to reach the target population more effectively and efficiently (Gyapong *et al.*, 2001; Babu and Kar, 2004; Nandha *et al.*, 2007). Hence to address these community specific factors, during the MDA planning stages, all the stakeholders (the pupils, teachers and the community at large) should be sensitized on all the necessary information concerning the MDA exercise. Such information could include;

information on the drug side effects, the dosage, who is to meet the treatment costs, in cases of adverse events (AEs), and the role of the teachers in the MDA exercise. The health providers should also be brought on board to assist in handling any adverse side effects that might arise. Effective management of adverse side effects in the first years of treatment will be beneficial to the program in subsequent years as it will reassure the community at large that the drugs are safe hence help build on trust between the community and the MDA organizers.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of Findings

The study revealed that knowledge of the MDA programme and the diseases of interest were the strongest predictors of non-compliance among the school going children aged 12-17 years. In addition, the study also revealed that most of the health teachers, who taught science as a subject, were more knowledgeable and aware of schistosomiasis, than their counterparts who taught other subjects. Majority of the health teachers perceived community members (parents) did not appreciate the role played by the health teachers, as “drug distributors”. Ninety two point eight percent of the pupils were able to personalize the benefits of the MDA to their own health hence leaving the other seven point eight percent non-compliant thus able to act as future reservoirs for infection. The health teachers perceived as a benefit the improvement in the school attendance and the pupils’ health in general. Finally, the study noted that some of the other factors associated with MDA non-compliance, included: fear of adverse side effects, fear of the drug size and dosage, fear of meeting treatment costs by both the parent and the school administration and lastly the perceived “benefits” associated with the MDA exercise, by the other teachers.

6.2 Conclusions

In conclusion;

1. The study found that the low levels of knowledge on schistosomiasis, together with that of the MDA programme, amongst the pupils are the strongest predictors of non-compliance. In addition, the study also found that science health teachers are more knowledgeable on matters to do with schistosomiasis than their non-science counterparts.
2. The study noted that the community lacks confidence on the role the health teachers play as drug distributors in schools.

3. The non-compliant pupils are not able to personalize any of the benefits of the MDA to their own health.
4. Other community specific factors associated with MDA non-compliance in this study include; the fear of adverse events, the fear of size and the dosage of the drug, fear of meeting referral treatment costs by both the parent and the school administration and lack of team work amongst teachers in carrying out the MDA activity.

6.3. Recommendations from this Study

1. Train all health teachers on matters to do with schistosomiasis and MDA so that they are able to pass the knowledge to their target population thus addressing the fears of their target population, and ensuring MDA compliance.
2. There is need to gain support of all the stakeholders, on the role of the health teacher as a drug distributor.
3. There is need for Pre-MDA sensitization of the pupils, to help them understand the benefits of MDAs. In designing the Pre-MDA sensitization messages, one should aim at: i) making the pupils aware of the occurrence of the MDA in advance, ii) making the pupils aware of the purpose of treatment, iii) making them aware that everyone is at risk of infection and that one could be infected and still feel fairly well or not show any clinical signs of the disease, iv) Assure them that the side effects in MDAs are infrequent and mild, and their frequency decreased after the first round of MDA .
4. There is need to engage all the stakeholders to be involved in the MDA activities, in the planning.

6.4 Recommendations for Future Studies

1. More long term studies to be done to access the effect of MDA treatment on school attendance and school performance.

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Appendix 1: COPY OF INFORMED CONSENT FORM

TITLE: FACTORS INFLUENCING MASS DRUG ADMINISTRATION COMPLIANCE FOR SCHISTOSOMIASIS IN PRIMARY SCHOOLS ALONG THE SHORES OF LAKE VICTORIA, KENYA

a. Statement that the study involves research

This is a project in which we want to participate is a research activity.

b. Explanation of the purpose of the research

We would like to understand your perspectives and experiences on this first time MDA activity towards schistosomiasis control in schools along the shores of Lake Victoria, in Kenya. The purpose is to determine factors that influence compliance on a first time MDA exercise amongst school going children in areas with $\geq 25\%$ prevalence of schistosomiasis along the shores of Lake Victoria in Kenya.

c. Description of the procedures to be followed

We will ask questions on your perspectives and experiences on this first time MDA activity. We want to learn more about the challenges you faced during the exercise. With your permission, we may take pictures of activities in the community as well as the group and take notes, which will help us to explain our findings. We will go to different sub-counties, talk to different health teachers and pupils aged 12-17 years like you in groups. With your permission, some of the conversations may be taped recorded, so that we do not miss out some of the important things that are said.

d. Expected duration of participation in the research

We will talk to you for about 45 – 60 minutes. The questions are general but if you find that some questions are not going well with you, please do not feel compelled to answer any of them for any reason.

e. Disclosure of appropriate alternative to participation

We shall appreciate your participation in this study: however, feel free to decline this request if you are uncomfortable. Taking part in this study will not cost you or your family anything. You may also leave this study at any time, even after agreeing to participate. You can leave for any reason without any problems.

f. Description of any benefits to the subject or to others, which may reasonably be expected from the research

You and your family may not get any direct benefits from being in this study but what you tell us will help us better develop a strategy for strengthening schistosomiasis control activities and thus improve the health of the people in this community.

g. Risk involved

The risk involved in this research is minimal. The risk relates to possible inconveniences with regard to privacy and confidentiality. However, in a group discussion such as this we ask you to only speak of general community experiences, rather than revealing individuals' names. We also request that you do not share personal information from this discussion with people in the community.

h. Confidentiality of Records

Your name and what you say to us for this study will be kept private as much as the law allows. The information you provide shall remain confidential, and your names or any information that may identify you will not be included in reports. The questionnaires, tapes, notes, pictures and transcripts shall be stored in a place where only the research team will have access. This will be for a period of one year after completing the study, after which they will be destroyed.

i. Questions about the Research

1. Do you have any questions about the study and your participation? (Yes/NO).
2. Do you agree to participate in this group discussion? (Yes/NO)

If you have any questions about this study, you may contact the Principal Investigator, Ongutu Michael Otieno on phone number 0725 – 647264.

If you agree to answer our questions and participate in this study, you can show us that you've agreed by putting your name and signature in the space below.

I have read (or been read for) the foregoing information or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to participate as a subject in this study and understand that I have the right to withdraw from the study at any time without in any way affecting my further health care.

Individual Participant's name/signature

Date

Interpreter/Witness's signature

Date

Person conducting the informed consent signature

Date

Appendix 2: COPY OF A QUESTIONNAIRE THAT WAS ADMINISTERED TO 12-17 YEAR OLDS

TITLE: FACTORS INFLUENCING MASS DRUG ADMINISTRATION COMPLIANCE FOR SCHISTOSOMIASIS IN PRIMARY SCHOOLS ALONG THE SHORES OF LAKE VICTORIA, KENYA

Questionnaire number

Instructions

- Only interview pupils between the ages of 12 – 17 years.
- Please mark where applicable by use of a tick (✓)
- All the responses remain confidential
- Interviewer to countercheck if all questions are well answered.

Descriptive characteristics

1 How old are you in years (write down your age in years in the box)

2. What gender are you? male female

Knowledge of disease and programme

3. Have you ever swallowed this tablet? (Respondent is shown a sample of the tablet)

Yes, I have No, I haven't

4. If yes, when did you first swallow it? (Give year)

5. Why did you swallow it? (Give reasons for taking the drug)

6. Have you ever heard of bilharzia or schistosomiasis?

Yes, I have No, I haven't

7. If yes, do you know how it is transmitted? Yes I do No, I don't

8. If yes, how is it transmitted?

9. Do you know of any ways you can use to protect yourself against bilharzia infection?

Yes I do No, I don't know of any ways

10. If yes, please write down one way.

Risk of contracting Bilharzia/schistosomiasis infection

11. Have you ever tested positive for bilharzia infection? Yes No

12. If No, do you think you can get bilharzia infection now?

Yes I can get bilharzia infection No, I cannot get bilharzia infection

Thank you for your participation

Appendix 3: COPY OF AN INTERVIEW GUIDE THAT WAS ADMINISTERED TO HEALTH TEACHERS

TITLE: FACTORS INFLUENCING MASS DRUG ADMINISTRATION COMPLIANCE FOR SCHISTOSOMIASIS IN PRIMARY SCHOOLS ALONG THE SHORES OF LAKE VICTORIA, KENYA

Instructions

- The group discussion should take between 45 – 60 minutes
- Before the start of the group discussion, the following people and materials should be available:
 - Note taker, an observer and a moderator
 - 2 recorders and a notebook
- Remind the participants to speak audibly for the recorder to tape whatever is being discussed.
- All the participants to introduce themselves before speaking.

Knowledge and Awareness on schistosomiasis

1. Have you ever had of bilharzia/schistosomiasis?
2. How is it transmitted?
3. What are the signs and symptoms of bilharzia?
4. Can bilharzia be treated?
5. Are you at risk of bilharzia?
6. How can you protect yourself from bilharzia infection?

Perceptions of the community on the role of a health teacher as a drug distributor

1. Are you happy with your role as a drug distributor in the programme?
2. Would you like to continue working as a drug distributor?

Perceived benefits associated with the MDA exercise

3. Was the programme beneficial to you? (Probe for the benefits of the program to both the teacher and the pupils)

Factors for non-compliance to the MDA exercise

4. What challenges did you experience during the treatment exercise? (Probe for; -acceptability of a health teacher as “drug distributor” by the community, side effects of the drugs, propaganda, religious persuasion, treatment timing e.t.c

Appendix 4: KATO KATZ – STANDARD OPERATING PROCEDURE (SOP) (Yvette E 2005)

Materials

1. Kato-set
(Template with hole, screen, nylon or plastic, plastic spatula)
2. Newspaper or glazed tile
3. Microscope slides
4. Cellophane as cover slip, soaked in Glycerol-malachite green solution
5. Fresh stool
6. Gloves

Procedure:

1. Prepare the layer
2. Glaze tile or newspaper
3. Place the template with hole in the centre of a microscope slide
4. Using gloves, place a small amount of fecal material on the newspaper or the glazed tile.
5. Press the screen on top so that some of the feces filter through and scrape with the flat spatula across the upper surface to collect the filtered feces.
6. Add the collected feces in the hole of the template so that it is completely filled.
7. Remove the template carefully so that the cylinder of feces is left on the slide.
8. Cover the fecal material with the pre-soaked cellophane strip.
9. Invert the microscope slide and firmly press the fecal sample against the cellophane strip on a smooth hard surface such as a tile. The material will be spread evenly.
10. Carefully remove the slide by gently sliding it sideways to avoid separating the cellophane strip. Place the slide with the cellophane upwards.
11. The smear should be examined in a systematic manner and the eggs of each species reported.

Appendix 5: COPY OF ETHICAL CLEARANCE FORM



KENYA MEDICAL RESEARCH INSTITUTE

KEMRI/RES/7/3/1
TO:

PAULINE MWINZI,
PRINCIPAL INVESTIGATOR

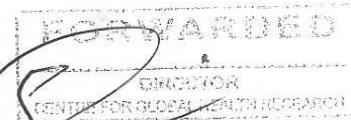
THRO':

DR. JOHN VULULE,
THE DIRECTOR, CGHR,
KISUMU

RE:

SSC NO. 1820 (REQUEST FOR ANNUAL RENEWAL): COMPARISON OF SCHOOL AND COMMUNITY-BASED MASS DRUG ADMINISTRATION DELIVERY STRATEGIES FOR CONTROL OF SCHISTOSOMA MANSONI INFECTIONS IN WESTERN KENYA IN AREAS WITH >25% PREVALENCE.

August 9, 2011



This is to inform that during the 192nd meeting of the KEMRI/ERC-meeting held on the 9th of August 2011, the Committee conducted the annual review and approved the above referenced application for another year. Future plans are to continue with microscopic examinations for all the 157,000 stool slides generated from the baseline study and carry out qualitative evaluations and data entry and cleaning.

This approval is valid from today **August 9, 2011** through to **August 9, 2012**. Please note that authorization to conduct this study will automatically expire on **August 8, 2012**.

If you plan to continue with data collection or analysis beyond this date please submit an application for continuing approval to the ERC secretariat by **June 8, 2012**.

You are required to submit any amendments to this protocol and other information pertinent to human participation in this study to the SSC and ERC for review prior to initiation.

Yours sincerely,

RGTK
Caroline Kithinji,
FOR: Secretary
KEMRI/ETHICS REVIEW COMMITTEE

Appendix 6: Results of preliminary analysis of factors contributing to MDA Non-compliance

Questionnaire variable	Non-compliant		Crude Odds ratio (95% CI)	p value	
	(n = 37)				
Perceived benefits associated with the MDA programme					
Do you know the reasons for swallowing drug?	No	35	8.5	17.163(4.075–72.296) 1.00 (Ref)	
	Yes†	2	0.5		
Knowledge of disease and programme					
Have you ever heard of bilharzia/schistosomiasis?	No	7	1.7	11.783(4.001–37.700) 1.00 (Ref)	
	Yes†	30	7.3		
Do you know how it [schistosomiasis] is transmitted?	No	22	5.4	0.857(0.432 – 1.703) 1.00 (Ref)	
	Yes†	15	3.6		
Do you know of ways to protect yourself against bilharzia/schistosomiasis infection?	No	12	2.9	0.903 (0.441 – 1.851) 1.00 (Ref)	
	Yes†	25	6.1		
Ever tested positive for bilharzia?	No	34	8.3	2.731 (0.818 - 9.116) 1.00 (Ref)	
	Yes†	3	0.7		
Are you at risk of bilharzia	No	12	2.9	0.903 (0.441 – 1.851) 1.00 (Ref)	
	Yes†	25	6.1		