

COMMUNITY PERCEPTIONS ON THE COMMUNITY-DIRECTED TREATMENT AND SCHOOL-BASED APPROACHES FOR THE CONTROL OF SCHISTOSOMIASIS AND SOIL-TRANSMITTED HELMINTHIASIS AMONG SCHOOL-AGE CHILDREN IN LUSHOTO DISTRICT, TANZANIA

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Summary. The success of the Community-Directed Treatment (ComDT) approach in the control of onchocerciasis and filariasis has caught the attention of other disease control programmes. In this study the ComDT approach was implemented and compared with the school-based approach for control of schistosomiasis and soil-transmitted helminthiasis among school-age children in Lushoto District, Tanzania. This was a qualitative study, consisting of in-depth interviews with village leaders, community drug distributors (CDDs) and schoolteachers, as well as focus group discussions with separate groups of mothers and fathers to assess the perceptions and experiences of the villagers on the implementation of the two approaches. It was found that the villagers accepted the ComDT approach and took the responsibility of selecting the CDDs, organizing and implementing their own method of distributing drugs to the school-age children in their villages. The ComDT approach was well received and was successfully implemented in the villages. Although the villagers pointed out the limitation in reaching the non-enrolled children in the school-based approach, they also expressed satisfaction with this approach. This study suggests that the ComDT approach is well accepted and can be implemented effectively to ensure better coverage of especially non-enrolled school-age children.

Introduction

Delivering regular treatment at appropriate intervals to school-age children and ensuring high and sustainable coverage is a strategy to control morbidity due to

schistosomiasis and soil-transmitted helminthiasis (STHs) (WHO, 2006). School-based de-worming programmes have been the main strategy to achieve this (Savioli *et al.*, 1997; Partnership for Child Development, 1998; Magnussen *et al.*, 2001). However, the school-based approach is faced with a limitation in areas with low rates of enrolment and attendance, because school-based de-worming programmes might not access a significant proportion of out-of-school children, who may also be at risk of these infections.

In 1995, the Special Programme for Research and Training in Tropical Diseases (TDR) introduced the ComDT approach. In this approach, the endemic communities implement the treatment themselves. The community selects the mode of drug delivery and is responsible for organization and implementation once it has received the necessary information and training (TDR, 2000a). In 1996 the African Programme for Onchocerciasis Control (APOC) implemented the ComDT approach in a number of African countries and achieved the treatment coverage required to eliminate onchocerciasis as a public health problem (TDR, 2000b). The ComDT approach was also introduced in Ghana and Kenya for mass treatment in the control of lymphatic filariasis and achieved high levels of treatment coverage (TDR, 2000b).

The success of the ComDT approach in the control of onchocerciasis and lymphatic filariasis caught the attention of other disease control programmes and WHO recommended the use of the ComDT approach in the control of schistosomiasis and STHs (WHO, 2002). However, there are only a few studies on the effectiveness of this approach for the control of these infections. Thus, in Uganda, where the ComDT approach already is in use for the control of onchocerciasis, the advantages and disadvantages of integrating schistosomiasis and STHs control have been investigated (Ndyomugenyi & Kabatereine, 2003). However, the ComDT approach has never been used in Tanzania for the control of schistosomiasis and STHs, and therefore a study was undertaken to compare the ComDT and the school-based approaches with regard to effect on infection and coverage of school-age children (Massa *et al.*, in press a,b). As part of the study, data on perceptions, attitudes and experiences of the villagers during the drug distribution process at the community level were collected and are presented here.

Methods

Study area and population

The study was conducted in Uмба Division, a lowland division in Lushoto District, Tanga Region. The district is situated in the northern part of the Tanga Region and borders the Same District in the Kilimanjaro Region to the north-west, and the Republic of Kenya to the north. To the south it borders Korogwe District, while it borders Muheza District in the Tanga Region to the east. Administratively, Lushoto District is divided into eight divisions, 32 wards and 137 registered villages with a population estimated at 419,970 people, of which 132,046 are estimated to be school-age children (6–15 years) (National Bureau of Statistics, 2002). The main ethnic groups in Lushoto are the Sambia (about 70%), the Pare and the Mbugu. The majority (98%) of the population are peasants who are engaged in small-scale farming

and petty trade. The population in Uмба Division is generally very homogeneous with respect to socioeconomic level. The main food crops are potatoes, rice, beans, bananas, maize and cassava, while other vegetables, fruits, tea, coffee and ginger are grown as cash crops. About 60% of the population keep cattle, sheep, goats or chickens. Lushoto District covers an area of about 3500 km², of which arable land accounts for 50–80% (National Bureau of Statistics, 2004).

The district has an altitude ranging from 300 to 2400 m above sea level and experiences high rainfall, ranging from 600 to 1200 mm per annum, with an annual average of 1100 mm. The long rainy period occurs from March to May, while short rains occur from October to December. Mean daily temperatures are highest in January and lowest in July. The dry season is short from January to March and the month of September is also occasionally dry. The highlands (2666 km²) cover about 75% of the district and are characterized by cold weather with a mean annual temperature of 17–18°C, while the hot lowlands have mean temperatures of 25–27°C (Tanzania Meteorological Agency, 2004). The Uмба River and other seasonal streams pass through the lowlands. Uмба Division, which has thirteen villages and seventeen primary schools, is served by one health centre and two dispensaries.

Ethical considerations

Ethical clearance was obtained from the National Medical Research Coordinating Committee of the National Institute for Medical Research in Tanzania (ref.: NIMR/HQ/R.8a/Vol.IX/127). The Danish National Committee on Biomedical Research Ethics recommended the study (ref.: 624–03–0016). Regional and district health authorities, regional and district education authorities as well as village leaders and head teachers were informed about the study before it started. Information meetings were held in each study school and village to explain the purpose of the study. The purpose of the survey was explained as a means of assessing the distribution process and study populations were asked verbal permission before they participated in the study. The respondents were informed that their names would not be recorded. This was done to ensure privacy of the respondents and give them ample room for a free discussion.

Description of the two drug delivery methods

Community-Directed Treatment (ComDT) approach. In this approach the villagers were empowered to decide their own methods of distributing drugs, at their convenient time and ideal places of delivery. Moreover, the villagers selected people whom they thought would be able to distribute drugs to the children and they were trained by the research team. After training, the distributors were provided with free anthelmintic drugs to treat children once a year with praziquantel (40 mg/kg body weight) for schistosomiasis using a ‘praziquantel dose pole’ and albendazole (400 mg in one dose) twice a year for STHs.

School-based treatment approach. In this approach, schoolteachers in the schools of the selected villages were also trained and administered the treatment to the

children in schools. Non-enrolled school-age children were invited to come to schools for treatment. After training, the teachers were provided with free anthelmintic drugs to treat both enrolled and non-enrolled school-age as explained above.

Methods of data collection

A demographic survey of all school-age children was conducted in all ten villages, which were randomly selected in the district for the study. The villages were divided into two groups and each group was then randomly allocated to take part in one or the other intervention approaches. Five schools were allocated to the ComDT approach and five were allocated to the school-based treatment approach. Although all participating villages were in the same division within the district, they were separated by unoccupied natural boundaries. The two intervention approaches were implemented concurrently and delivered two rounds of treatment within the duration of one year. After each round of treatment a qualitative survey was conducted to assess the perceptions and experiences of the villagers in the implementation of the two approaches.

The qualitative methods to assess the process of implementation consisted of in-depth interviews (IDIs) with the following key informants: village leaders, community drug distributors (CDDs) and schoolteachers who distributed drugs. Moreover, in each village a separate group of mothers and fathers, all with one or more school-age child, participated in focus group discussions (FGDs) with 8–12 participants in each group. Two FGDs were held in each village and the research team, including a social scientist, conducted all IDIs and FGDs. After each round of treatment, a total of 20 IDIs and 20 FGDs were conducted. Direct observation was also used to observe how the villagers selected the CDDs during village meetings.

The village leaders from all ten villages were asked for their views on (i) the usefulness of distributing drugs to their children, (ii) how they sensitized the villagers to the drug distribution, (iii) suitability of method used for the distribution, and (iv) the issue of incentives given to the CDDs or schoolteachers.

The CDDs and schoolteachers who distributed drugs were asked for their views on (i) the importance of distributing drugs to the children, (ii) reasons for accepting the task of distributing drugs, (iii) method used for the distribution of drugs to the children, (iv) incentives given to the distributors, (v) problems faced during drug distribution, and (vi) willingness to continue with the task of drug distribution.

Both mothers and fathers in separate FGDs were asked for their views on (i) awareness of distribution of drugs to the children, (ii) the importance of distributing drugs to their children, (iii) method used for the distribution of drugs to the children, and (iv) satisfaction with the assigned approach (ComDT or school-based approach).

Finally, all IDI informants and FGD participants were asked about willingness to share the cost of the project and were also asked for their suggestions regarding what could be done to improve the implementation of drug distribution to the children.

Implementation of the two drug delivery methods

Sensitization at administrative levels. Initially, the research team informed the Lushoto District Commissioner (DC) about the project. In the ComDT approach

villages the DC introduced the research team to the Uмба Division Executive Officer (DEU). The DEU was briefed about the planned research project and appointments for visits to the villages were made well in advance. In the school-based approach villages the research team informed the Lushoto District Education Officer (DEO) about the project. The DEO introduced the research team to the Ward Education Officer (WEO) and appointments for visits to the schools were made well in advance. The research team introduced the project to all the village leaders or their representatives and arrangements were made to meet the leaders of sub-villages. This was followed by a more detailed briefing of the various political heads about mass chemotherapy of the children using the concept of the ComDT approach and the school-based approach. The issues discussed included that annual, single-dose mass chemotherapy by ComDT was a new approach in the control of schistosomiasis and STHs and it was important and necessary to achieve high coverage in order to control the infections. The present politicians promised to give their support to the project. Then, the entire community met on a mutually accepted and convenient date.

Sensitization meetings at village level. In these meetings the leaders of the villages would initially inform people about the purpose of the visiting researchers. Later, the research team introduced the issue of the ComDT approach and the school-based approach to the villagers. These meetings provided an opportunity to review the problems of schistosomiasis and STHs, its transmission and the benefits of controlling the infections by mass chemotherapy, and recognition of possible side-effects and their management. The villagers were engaged in a discussion of their experience of the various aspects of the infections. In the ComDT villages the concept of this approach was introduced and the need for selecting CDDs was explained. In the school-based approach villages the role of the schoolteachers in distributing drugs at the schools was explained to the villagers. The villagers were given the opportunity to ask questions to the research team, who provided clarifications. In the ComDT villages the research team explained the specific role of CDDs in the administration of drugs to the school-age children. Every village was required to formulate criteria for the CDDs to be selected and later selections were made. The villagers also had to decide the mode of distribution and how they would ensure that all children would be treated.

Training of the drug distributors (CDDs and schoolteachers). The research team brought together the selected CDDs from all villages and trained them for one day. The schoolteachers were also trained for one day in a separate venue. The training focused on the infections, drugs and how to deliver them, likely side-effects and how to handle them as well as record keeping. Skills were developed for determining dosage by measuring height using the dose pole. After training, all the CDDs and the schoolteachers were provided with anthelmintic drugs to treat school-age children once a year with praziquantel for schistosomiasis (40 mg/kg body weight) and albendazole (400 mg in one dose) twice a year for STHs. They were required to use the 'praziquantel dose poles', which are based on height to determine dosage for the treatment of schistosomiasis.

Data analysis

The FGD and IDI notes were transcribed by hand. Summary transcripts were segmented and coded. Then, the codes were revised, organized and summarized for analysis. The methods used included ethnographic summaries, content analysis, direct quotations and selected words to give consideration to actual local words used by the participants. Quantitative data collected were mainly on variables such as age, occupation and education levels, which were analysed using STATA 9 (Stata Corporation, 2006).

Results

Characteristics of the study populations

During the first qualitative survey (conducted at the end of the first round of treatment) the mean age of the FGD participants was 29 years for mothers (range: 26–36 years) and 38 years for fathers (range: 30–51 years) in the villages with the ComDT approach. In the villages with the school-based approach it was 31 years for mothers (range: 25–40 years) and 37 years for fathers (range: 30–49 years). Among the interviewed fathers, 99.0% had primary education, while 97.9% of the interviewed mothers had primary education. There was no difference in level of education within and between the areas using the two different approaches. Regarding the IDI participants, all the village leaders interviewed were males with a mean age of 52 years (range: 48–61 years) and all had completed primary education. Of the selected CDDs, 66.7% were males and 33.3% were females and all had completed primary education. As for age distributions of the CDDs, 25.0% were aged 20–29 years, 58.3% were aged 30–39 years and 16.7% were aged 40 years and above. All the schoolteachers who distributed drugs had attended secondary schools and had a mean age of 32 years (range: 27–42 years). The primary occupation of FGD and IDI participants was farming, with the exception of the schoolteachers.

Response and receptiveness to the intervention approaches for the control of schistosomiasis and STHs

It usually took two to three visits with briefings to introduce the ComDT approach in the village. The villagers were warm and open, clearly appreciative of the researchers' support to the control of these infections in their villages. In some cases, the villagers showed their appreciation for the project by giving gifts and offering meals. In the ComDT approach, the CDDs were members of the villages chosen by the villages through a democratic process and later trained to distribute drugs. Different villages had varying criteria for the selection of their CDDs. Generally, all villages included the following: ability to read and write, being respected in a village and having qualities of good character, such as integrity, honesty and hard working. Apart from these qualities, the number of distributors per village, process of selection, and their sex varied among the villages. Usually two distributors were selected for each village, one of these often a woman, but sometimes three CDDs were selected.

Three villages selected their CDDs during their general meetings. No votes were cast in the general meetings; instead some villagers proposed names of CDDs and decisions were reached by consensus. Although distributors should be selected by the entire community, it was decided in two villages that the village executive committee should select the CDDs. In one village, the committee asked the research team to remain in the meeting room and they went out for a moment and came back with the names of the CDDs. It was not known how they selected their CDDs. In another village, the executive committee decided to cast votes to select their CDDs. All the CDDs in the ComDT villages implemented the house-to-house approach for drug delivery. However, in the second round of treatment some villages made a few changes to the mode of distribution, as they combined the house-to-house distribution with a central point distribution. A number of villages changed a CDD for various reasons including pregnancy or illness. In one village a married female CDD was changed because she did not want to continue working with the male CDD. Instead, she wanted to work with her husband.

In the villages where the school-based approach was implemented, both the enrolled and non-enrolled school-age children were treated in schools. Most of the included schoolteachers were those who were concerned with the health affairs and these were selected by the head teachers. The village authorities had no influence on the selection. The school authorities appreciated the project for the control of schistosomiasis and STHs in schoolchildren.

Perceptions and experiences of the villagers regarding the implementation of the two drug delivery approaches

Leaders of ComDT approach villages, as well as of school-based approach villages, were generally aware of the importance of distributing drugs to the school-age children. Thus, one village leader in his fifties stated:

We know by giving these drugs, our children are treated and protected from getting schistosomiasis.

The village leaders in all ten villages acknowledged the importance of drug distribution to their children against schistosomiasis (locally known as *kichocho*). Furthermore, in the course of discussion with the village leaders most of them acknowledged having seen children with blood in their urine (haematuria), but after being treated the children no longer had haematuria. This is an indication that the village leaders associated the effect of the drug with the absence of haematuria.

When the CDDs and the schoolteachers were asked about the importance of distributing drugs to the children, all were generally aware of the importance and they all knew that it was for the control of schistosomiasis and STHs in their villages.

Methods used in distributing drugs to the school-age children

In the ComDT approach, most CDDs reported using house-to-house visits as their main method of distributing drugs to the school-age children. However, in the second round of treatment the CDDs in two villages reported using a combination of house-to-house and central point distribution.

In the school-based treatment approach, all schools treated schoolchildren at their schools and the schoolteachers used the enrolled children to inform their fellows' non-enrolled children at home to come to schools for treatment.

It was apparent from the discussion that village leaders in both the ComDT and school-based approach villages used their routine general village meetings to sensitize the villagers to the distribution of drugs to the children. Moreover, in the discussions it was also pointed out that the villages held special general meetings to further sensitize their villagers to the drug distribution to the children.

Opinions of the village leaders on methods of drug distribution to the children

The village leaders in the ComDT villages appreciated the use of the house-to-house method of distributing drugs to the children in their village. As some village leaders explicitly said:

This is a good method because you are likely to get every child at home.

Although the village leaders seemed to prefer the house-to-house method of drug distribution, some villages combined the house-to-house distribution with a central point distribution in the second round of treatment. The village leaders pointed out that the main reason for combining the two methods of drug distribution was because of increased awareness of the villagers on the importance of the drugs and that they were able to send their children to go for treatment themselves.

The leaders in the villages using the school-based approach generally expressed satisfaction with the method of distributing drugs to the school-age children, although some leaders felt that some sub-villages are located very far from the school and it could be difficult for some parents to send their children to the school for treatment. This problem of non-enrolled children not being able to come to schools for treatment seemed to be a strong concern among the majority of the village leaders, as a 49-years-old village leader argued:

Some children may not be ready to go to school for treatment because they are living in sub-villages which are located very far from the school.

Reasons given by the CDDs and schoolteachers for accepting to distribute the drugs

In-depth interviews with the CDDs pointed out that they were doing the task of distributing drugs in order to help the children of their villages from suffering from these infections, as a 30-year-old male CDD asserted:

We are doing this to help our children from these bad diseases, as well as helping some parents who cannot send their children to hospital.

In-depth interviews with the schoolteachers identified some of the reasons why they agreed to carry out the task of distributing drugs to the school-age children:

Controlling schistosomiasis and STHs among the children in their villages.

Being a teacher dealing with school health affairs.

Because the research team diagnosed their schoolchildren and found many of them had infections.

It seems that both the CDDs and the schoolteachers had relatively similar reasons for accepting the task of distributing the drugs to the children.

The issue of giving incentives to the drug distributors (CDDs and schoolteachers)

Village leaders in villages where the ComDT approach was implemented agreed that it was important to offer their CDDs some kind of incentives, although they admitted that they were not able to support them, particularly financially, because of the poor economic situation of their villages. However, two villages hired bicycles for their CDDs to go to the sub-villages that were located far away from the village centres.

Similarly, the village leaders in school-based approach villages acknowledged the importance of giving some incentives to the schoolteachers who were distributing drugs to their children. However, they felt that the school authorities should find their own means of motivating their schoolteachers, as one 51-year-old leader indicated:

Although the school is within our village, the school authority can find some assistance of supporting their teachers elsewhere even from the district authority.

In-depth interviews with the CDDs confirmed lack of incentives from the villages in terms of financial support. However, the CDDs from two villages appreciated the support of hired bicycles. Although some CDDs pointed out that they would appreciate some kind of incentive, they made it clear that they viewed it as a kind of appreciation and not a necessary entity.

Willingness to continue undertaking drug distribution

In-depth interviews revealed that the CDDs were very motivated to continue to distribute drugs to the school-age children. The following quotes are typical of their responses:

Why not? Parents have seen the benefit that their children get from taking these drugs.

I am willing to help our future generation from these infections.

It is prestigious being recognized as a local doctor.

Likewise, in school-based approach villages, all schoolteachers reported lack of incentives. They felt similarly that they would appreciate some kind of incentive. However, they did not point out any specific kind of incentive they would prefer.

When the teachers were asked about their willingness to continue with the task despite the lack of incentives, they generally pointed out that they were willing to continue to distribute anthelmintic drugs to the children, as one schoolteacher in his thirties stressed:

We should be willing to continue with this task because when these children are healthy, they will be able to learn effectively and that is what we want.

Problems of side-effects and long distance to drug distribution

In the ComDT approach, some CDDs reported having received complaints from a number of parents about side-effects, although it was apparent from the in-depth

interviews that these side-effects were not serious. As one 28-year-old female CDD explicitly said:

I think some children experienced mild abdominal pain because their parents did not give them some food to eat before taking these drugs.

Apart from anxieties of side-effects, some CDDs pointed out that a number of sub-villages were located far from the village centres, as one male CDD said:

The (hired) bicycle that we were supported with really helped us to reach the children in some sub-villages which were located very far from the village centre.

Referring to the sub-villages that were located far away, another male CDD had this comment:

It can be difficult to go back to treat the children who were absent during the distribution time.

In the area with the school-based approach some schoolteachers reported having seen children complaining about abdominal pain and nausea after treatment. One schoolteacher did not feel shy about testifying how worried she was when she observed a child complaining about abdominal discomfort after taking the drugs and she explicitly and happily said:

Fortunately the child recovered herself just in my presence indicating that truly these side-effects can go away.

As some schoolteachers pointed out, many non-enrolled children did not come to schools for treatment because some sub-villages are located very far from the school and, therefore, it can be difficult for the parents to bring or encourage their children to go to schools for treatment. As one 32-year-old schoolteacher testified:

... especially those who feel their children are not suffering from these infections.

The schoolteachers affirmed that many parents with non-enrolled school-age children did not send their children to schools as they assumed that they were not infected because they did not show any symptoms.

Mothers' and fathers' awareness and perceived effects of drugs on the children

During the FGDs, mothers and fathers in both types of village generally expressed awareness of drugs being distributed to the children. Moreover, mothers and fathers were generally aware of the importance of the drugs to the children. An assertive statement from a mother in her thirties was:

These drugs have helped our children, who were suffering from these infections and you can now see them better-off.

Along with the effects of the drugs, some parents referred to a few children who had experienced side-effects of the drugs, as one mother pointed out:

Some children experienced a mild abdominal discomfort after taking these drugs.

Satisfaction with the CDDs distributing drugs to the children

In the ComDT approach, participants of FGDs expressed satisfaction with the CDDs distributing the drugs to their children, as a father in his forties expressed:

We liked and felt secure that our own people, whom we trusted and selected ourselves, did the task [of distributing the drugs].

In the school-based approach, mothers and fathers who were interviewed expressed their satisfaction with the school-based approach. Although the FGD participants from both intervention areas were satisfied with either the ComDT approach or the school-based approach, they offered some opinions on how to improve the approaches.

Opinions of mothers and fathers on the ComDT approach

In the ComDT approach, mothers and fathers had the following opinions on improving the drug delivery process:

More education should be given to the parents on the importance of drugs for their children.

More education should be given to the parents about the side-effects.

Village leaders should continue to sensitize the parents to participate fully in the drug delivery processes.

Opinions of mothers and fathers on the school-based approach

For the school-based approach, mothers and fathers felt that improvement of the drug delivery process could be achieved by the following:

More sensitization should be done to parents, especially those whose children are not attending schools.

Drugs to be made readily available at all times in schools.

Schoolteachers should also deliver drugs at home not only confined to schools.

Opinions of the village leaders in the two types of intervention villages

For the ComDT approach villages, all village leaders seemed to have shared the general concept that further mobilization was needed in order to achieve higher coverage of the treatment to the children. Village leaders in the school-based approach villages suggested that apart from distributing drugs at their schools, the schoolteachers should find some time to go to the villagers' homes to distribute drugs to other children. In expressing his opinion a leader was referring to what was being done in the villages where the ComDT approach was implemented and he elaborated this by saying:

If schoolteachers do not have time to come to our homes to distribute drugs, why don't we use other people (like the CDDs) to distribute drugs to our children?

Opinions of the CDDs

In the ComDT approach, the CDDs had the following opinions on improving the drug delivery process:

Each sub-village should have its own CDDs.

We should be considered for some kind of incentive as an appreciation.

The parents should adhere to the instruction of feeding their children before receiving drugs.

More education should be given to the parents about side-effects.

Opinions of the schoolteachers who distributed drugs

In the school-based approach, the schoolteachers had the following opinions on improving the drug delivery process:

Parents, especially those with children who are not attending schools, should be more sensitized to bring their children to schools for treatment.

Further training should be provided to schoolteachers who are distributing drugs to children.

We would appreciate some kind of incentives.

Willingness to pay for the treatment

Long-term sustainability of regular treatments of schistosomiasis and STHs may depend on the community willingness to contribute financially. The FGD participants were therefore asked about willingness to pay for the treatment. Although some participants were uncertain about the ability of the villagers to pay for the control of these infections due to the poor economic situation, most participants believed that the villagers could pay some money, as one 36-year-old male FGD participant from the ComDT approach expressed:

We are poor people, but as this treatment is for the benefit of our children I think most parents can pay when they are asked to.

Likewise, a 32-year-old female participant from a school-based approach village had this comment:

Why not? After all, these days we are required to pay for everything [health service] in our health units.

The FGD participants were also asked about their ability to contribute some payment for the treatment. They were given the options by selecting among the following categories: US\$0-05-0-10, US\$0-15-0-20 and US\$0-25-0-30. All the participants opted for the range US\$0-05-0-10.

Discussion

Perceptions regarding different approaches of drug delivery for the control of schistosomiasis and STHs were recorded during the process of implementing two intervention approaches. The ComDT approach has not been used before for the control of schistosomiasis and STHs in Tanzania, and therefore the results of this study represent the first experience with this approach. Generally, the ComDT approach was well received by the villagers and they also willingly and actively participated in the activities.

It was not the aim of this study to investigate the local understandings of schistosomiasis and STHs and whether people perceive the infections to be a public health problem. This has been reported in earlier studies from Kenya and Tanzania (Geissler, 1998a, b; Partnership for Child Development, 2001; Mwanga *et al.*, 2004). The intention of the present study was to investigate whether the coverage rates of a school-based control programme could be improved.

In the present study, treatment coverage was investigated among school-age children (Massa *et al.*, in press a). For the enrolled children coverage rates were similar for the two approaches (ComDT 80.3% vs school 82.1%, $p=0.07$). However, for the non-enrolled children the ComDT approach achieved a significantly higher treatment coverage than the school-based approach, where non-enrolled children were invited for treatment (80.0 vs 59.2%, $p<0.0005$). The same picture was seen during the second treatment round three months later, where the coverage rates increased slightly for all groups.

The ComDT approach is based on the principle of community participation and ownership whereby communities influence the decisions and resources that directly affect them. The importance of communities participating in their own health activities for a positive influence in treatment coverage has been noted elsewhere (Yassi *et al.*, 2003; Katabarwa *et al.*, 2005). Following the introduction to the concept of ComDT, the villagers were empowered to select their own CDDs, and a mode and timing of distributing drugs to school-age children. The process of selecting CDDs seems to have been adequate as the villagers fully accepted the CDDs who distributed drugs to their children. This can have a positive influence on the long-term sustainability of the ComDT approach.

An interesting point to note is that the CDDs distributed the drugs to the school-age children without monetary incentives. They expressed willingness to continue with the task of distributing drugs although, in the course of the interview, some CDDs expressed the feeling that they would appreciate some kind of incentive as an appreciation. This is consistent with the results of Amazigo *et al.* (2002), who also indicated that a high proportion of the CDDs who did not receive financial rewards or in-kind assistance from their community were willing to continue as drug distributors. Moreover, Amazigo *et al.* (2002) and Clemmons *et al.* (2002) found that providing incentives to CDDs did not improve treatment coverage compared with those who did not receive incentives. Thus, lack of financial incentives to the CDDs did not necessarily have a negative influence on the willingness of the CDDs to continue to distribute drugs to the children in the villages. If it is found to be important to offer incentives for the purpose of maintaining or increasing motivation of the CDDs, non-financial incentives in particular may be considered.

The in-depth interviews with the CDDs and schoolteachers pointed out that their main motivation for accepting the task of distributing drugs was to reduce the disease burden in the children and thereby improve their learning capabilities. This demonstrates that the CDDs and the schoolteachers had very positive reasons to carry out the task.

Experience gained from this study has demonstrated that both the ComDT approach and the school-based approach were effectively implemented. However, a number of factors pointed towards better sustainability of the ComDT approach.

Most important was a real acceptance of the ComDT approach from the beginning and the appreciation of the fact that villagers had an influence on decisions from the planning to the implementation of the drug distribution process. This means that by being able to manage the distribution themselves, confidence is built in communities. They were also in a position to change the process, so for example some villages changed the distribution strategy that was initially agreed upon and during the second round of treatment combined the house-to-house strategy with a central point strategy. This means that, having understood the objective of the drug distribution, the villagers could adopt a strategy that was more convenient for their villages.

It is interesting to note that the villagers seemed to have fully accepted the CDDs (all with primary education) to distribute drugs to the children, despite drug distribution always having been associated with the formal health sector where trained health workers dispense drugs to people after proper diagnosis. This positive attitude towards the CDDs may be due to the villagers' involvement in the selection process and may be important in enhancing long-term sustainability of the ComDT approach.

One other important issue to consider is cost sharing in health care, which can also be among the indices likely to sustain the ComDT approach in the control of schistosomiasis and STHs. In recent years, the health sector in Tanzania has moved from a concept of 'free services' to 'cost sharing' in which patients are required to pay user fees for health care services (Abdallah, 2003). Therefore, the need for community financing of intervention programmes cannot be over-emphasized in order to sustain them. In this perspective, the villagers' response to whether they would be willing to pay for the control of schistosomiasis and STHs is important. It was apparent that some showed doubts about the ability of the villagers to pay for the treatment because of their poor economic status, but most of them were of the opinion that most villagers could at least pay for the treatment. Generally, all participants were willing and agreed that they would pay for at least one tablet of praziquantel, as WHO (2004) indicated that one tablet of praziquantel should cost less than US\$0.10. This is consistent with what Magnussen *et al.* (2001) and Lwambo *et al.* (2005) found in Pangani and Sengerema Districts in Tanzania, namely that parents were willing to pay for treatment of schistosomiasis. This is encouraging in a country like Tanzania where the economic situation hinders the provision of free social services such as health care. This willingness of villagers to pay for a continued treatment is important for the sustainability of a control programme on schistosomiasis and STHs because the success of each control programme also depends on the goodwill and co-operation of the local people.

Although both the ComDT approach and the school-based approach were effectively implemented and generally accepted, there were problems which affected the acceptance of the approaches. It was apparent from the in-depth interviews with the CDDs that some children experienced side-effects, although these were reported not to be serious. Although the side-effects are associated with the drugs and not with any approach, it remains an important issue to consider in avoiding non-compliance, especially when non-health personnel such as CDDs or schoolteachers distribute drugs. Our results are in line with results achieved from a Ugandan study, where one of the reasons for rejecting free treatment was fear of side-effects (Parker *et al.*, 2008). The safety of the drugs needs to be explained thoroughly to parents and children and

it should be emphasized that most children do not experience any side-effects. A small minority report mild and short-lived side-effects, and these are most likely to occur in children with heavy infections and in those taking the drug on an empty stomach. In this context it is important that children should be given a small portion of staple food before treatment to reduce the frequency of side-effects. WHO (2002) has recommended that parents should be more informed about the range of side-effects and the ways to avoid them.

Apart from some anxiety regarding side-effects, a number of CDDs and schoolteachers pointed out that some sub-villages were located far from the village centres and schools. The CDDs felt that it was a burden to make additional home visits for children who were absent during drug distribution. In this perspective, long distances may be an important factor to take into account when planning the way of distributing drugs. To solve this problem more CDDs could be appointed to serve the sub-villages. However, experience from this study has shown that the ComDT approach offers better opportunities for easy access to the non-enrolled children compared with the school-based approach.

The problem of non-enrolled children not being able to come to schools for treatment seemed to be a strong concern among the majority of the villagers where the school-based approach was implemented. Some schoolteachers said that a number of non-enrolled children did not come to schools because they were living far from the schools. Moreover, they felt that some parents did not bring or mobilize their children to go to school for treatment probably because their children did not show any sign of these infections. This indicates that more mobilization for treatment is needed, especially for the parents of non-enrolled children. A study in Egypt showed that children who were not enrolled in schools had a higher prevalence of infection and were more intensely infected than children who attended school (Hussein *et al.*, 1996). Those suffering the most from these infections may be living in resource-poor communities and often in remote areas where there is minimal or no access to health care and other social services, which in turn can increase the infection rate for the whole village.

In general, the villagers believed that the school-based approach may be more likely to miss the non-enrolled children compared with the ComDT approach. Another difference between the implementation of these approaches is that the ComDT approach empowered the villagers to take decisions, gain confidence and manage their own drug distribution, which is fundamental in terms of community capacity building and sustainability. This may in the long term be important for increased treatment coverage in future control programmes. Further studies should aim at extending the research experience gained from the present study to practical application. Only if the commitment from the population can be sustained will the ComDT approach be an applicable approach for future control programmes.

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