Nath TC, Padmawati RS, Alam MS, Das S, Murhandarwati EH. Elimination of soil-transmitted helminthiasis infection in Bangladesh: Knowledge, attitudes, and practices regarding mass drug administration. *Journal of Global Health Reports*. 2018;2:e2018017. doi:10.29392/joghr.2.e2018017

Research Article

Elimination of soil-transmitted helminthiasis infection in Bangladesh: Knowledge, attitudes, and practices regarding mass drug administration

Tilak Chandra Nath[1], Retna Siwi Padmawati[2], Mohammad Shafiul Alam[3], Shobhan Das[3], Elsa Herdiana Murhandarwati[2]

[1] Special Program of Implementation Research, Public Health, Faculty of Medicine Universitas Gadjah Mada, Indonesia, [2] Faculty of Medicine, Universitas Gadjah Mada, Indonesia, [3] International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh

Keywords: global health

https://doi.org/10.29392/joghr.2.e2018017

Journal of Global Health Reports

Vol. 2, 2018

Background

Despite several cycles of Mass Drug Administration (MDA), however, the prevalence of Soil-transmitted helminthiasis (STH) remains high in Bangladesh. A clear understanding of local knowledge, attitudes, and practices (KAP) related to the acceptance and utilization of MDA is critical for effective implementation of this intervention.

Methods

This research, a cross-sectional descriptive study that utilized quantitative methods, was conducted between February and June 2017. A total of 380 questionnaire surveys were distributed to school-aged children (SAC), the parents of SAC, and school teachers.

Results

Out of 160 SACs, 81.9% knew of STH and 75.6% knew of MDA. SAC showed a high awareness of STH and recognized the importance of preventive measures and MDA. In terms of the parents of SAC and school teachers, close to half of the respondents were knowledgeable about STH and MDA. While nearly all of the participants held positive attitudes toward MDA, the respondents pointed out that school-based MDA presents severe limitations, as non-school-going children are neglected by this effort. A total of 68.3% of all school teachers and 56.8% of all parents of SAC found MDA efforts to be effective.

Conclusion

STH infections still remain a significant public health burden in Bangladesh. Reforming the MDA policy is necessary to achieve the target of STH elimination.

Soil-transmitted helminthiasis (STH) is a group of parasitic infections caused by intestinal worms and is the commonest parasitic infection worldwide, mainly due to a deficiency in sanitary facilities, unsafe human waste disposal systems, inadequacy of safe water supply and low socioeconomic status. The global estimate of STH infection was 438.9 million, 819.0 million, and 464.6 million people for hookworm, roundworm, and whipworm, respectively, in 2012.[1] The main risk groups are pre-school age children (pre-SAC), school-age children (SAC) and women of childbearing age. All 64 districts of Bangladesh are endemic for soil-transmitted helminthiasis. A national parasitological survey of Bangladesh in 2010 reported that 79.8% of school-age children were infected with one or more helminth species.[2] According to the SGDs target of eliminating STH within 2025, Bangladesh government implementing school-based mass drug administration (MDA) program since 2008. Despite the intensive efforts to control the disease, STH is still highly prevalent among children in several areas of the country. Several researchers reported a higher prevalence of STH in different areas of Bangladesh.[3–6] Nevertheless, even a moderate presence may permit parasites to keep up transmission limit. It is very likely that if drug interventions were interrupted as of now, prevalence would shortly reach abnormal levels.[5] The majority of peoples in Bangladesh do not take the necessary steps to prevent parasitic infection due to lack of attitude and practice. A number of researches have been conducted in various tropical countries where STH is endemic. Nasr *et al.* (2013) in Malaysia, Liu et al. (2015) in China and Parikh *et al.* (2013) in the Philippines studied on a different perspective of STH control program.[7–10] Unfortunately in Bangladesh, the contribution of similar types of research on STH issue have not received much attention yet. There are huge gaps between information on the impacts of the disease and the perception of the community people for prevention. Specific mis-

conceptions include lack of knowledge about the disease, who are at risk for the disease, how to target all population at risk, the need to target asymptomatic carriers and community misunderstanding of the drug being administered. There are limited reports focusing on how best to implement control intervention to increase success within the community. The objective of this study was to collect baseline information concerning community perception regarding STH and to deepen our understanding on the community KAP in two endemic districts in Bangladesh. The experience gained from this study might be useful for the design and implementation of any control program and the lessons learned might stimulate other control programs to think and act beyond effective implementation.

METHODS

STUDY SETTING

This was a cross-sectional descriptive study that utilized quantitative methods and conducted between the periods of February 2017 to June 2017. The study was done in selected areas of Dhaka and Sylhet district of Bangladesh where more than 70 million peoples are staying. Bangladesh is a country of over 162 million people divided into 64 districts. These two districts were selected because of listed as endemic, found a higher prevalence of STH and MDA is going on since 2010.[2,11]

STUDY POPULATION AND SAMPLING

In this study, the categories of the target population were defined as the school-aged children, relevant parents of school-age children and school teachers. An equal number of population was taken from each study areas. School age children in each study area were chosen randomly, with their ages ranging from 8 to 12 years old. Purposive sampling technique was used to select study population.

DATA COLLECTION AND ANALYSIS

Data was collected through well-structured semi-structured questionnaires. Specific questionnaire for each type of participants was used. Each questionnaire thoroughly investigated and explored the different claims to provide knowledge and related conclusions to the study phenomena. The questionnaires and guidelines were pilot-tested and then revised before use. Three hundred eighty (380) questionnaires survey was done among school-age children (160), relevant parents of school age children (160) and school teachers (60) to obtain information. The data were double entered in Microsoft Excel data sheets (Microsoft Inc, Seattle, WA, USA), cross checked and transferred. Statistical analysis was done after data validation.

RESEARCH ETHICS

This study was conducted according to the principles of the Helsinki declaration. Written informed consent was obtained from all participants prior to the interviews. Local language (Bengali) was used during all level of data collection. This study was approved by Ethical Committee of the Faculty of Medicine, University of Gadjah Mada, Yogyakarta, Indonesia.

RESULTS

The results were tabulated, percentage was calculated, and conclusions were drawn. The survey presented a comprehensive overview of the knowledge, attitudes, and practices of school-aged children, relevant parents and school teachers.

SOCIO-DEMOGRAPHIC CHARACTERISTICS' OF RESPONDENTS:

A total of 160 school-age children consists of both school going, and non-school going were interviewed with the semi-structured questionnaire. An equal number of school going and non-school going children were taken. Most of the study pupils were girls (61.9%) while boys were 38.1%. Most of respondents (88.7%) was within the age group of 9-12 years old (Table 1).

While, in case of parents of school-age children, the percentages and frequencies of respondents were 36.3% (n=58) males and 63.7% (n=102) females. Most of the participants (61.3%) with parents were within the 35-45 years old age group. Ninety-seven (60.6%) of the respondents were from rural areas, about 51.9% were unemployed or household workers by employment and, nearly 39.4% were completed maximum primary (I to V) level education. On the other hand, in case of school teachers, 71.7% participants were female teacher, which indicated that primary school teaching is being dominated by females. The rural participants were constituted (80%) of the total school teacher and most of teachers (60%) was more than 45 years old. About 51.7% of the teachers possess college certificates, while 43.3% have university degrees (Table 2).

SCHOOL-AGE CHILDREN'S KNOWLEDGE ABOUT CAUSE AND RISK FACTORS OF STH

When asked, "Have you heard of STH/intestinal worm?" A significant difference was found regarding knowledge of STH where 131 respondents (81.9%) stated yes, and 29 (18.1%) stated no. Regarding source of knowledge about STH, schools/teachers were found the main source where 39.7% respondents mentioned that they heard about STH infection from school/teachers. 25.9% respondents mentioned that they heard about STH from health workers and 17.6% children were heard from their parents. 13.7% and 3.1% participants were said electronic medias (radio/television) and community program as source of information respectively. When asking about source of transmission, majority of the children mentioned walking barefoot (91.6%) as the main source. Indiscriminate defecation and contaminated soil source were mentioned by 70.9% and 58.1% children respectively. Regarding specific knowledge about causes of STH infection, 46 children (35%) was able to mention that STH infection is caused by parasites or worm. Forty-four (33.6%) children stated that it is caused by organisms but they did not know the name. Twenty-nine (22.1%) children mentioned that STH infection is caused by

Table 1. Socio-demographic characteristics of School Age Children in Dhaka and Sylhet districts of Bangladesh, February – June 2017

Characteristics	(n=160)	
	Frequency	%
Geographic areas:		
Rural	97	60.6
Urban	63	39.4
School enrollment:		
School going	80	50
Non-school going	80	50
Gender:		
Male	61	38.1
Female	99	61.9
Age (years):		
<9	03	1.9
9-12	142	88.7
>12	15	9.4

Table 2. Socio-demographic characteristics of parents of SAC and school teachers in Dhaka and Sylhet districts of Bangladesh, February - June 2017

	Parents of SAC (n=160)		School teachers (n=60)	
	n	%	n	%
Geographic areas:				
Rural	97	60.6	48	80
Urban	63	39.4	12	20
Gender:				
Male	58	36.3	43	71.7
Female	102	63.7	17	28.3
Age (years):				
<25	13	8.1	-	-
25-35	29	18.1	03	05
36-45	98	61.3	21	35
>45	21	13.1	36	60
Employment:				
Farmer	31	19.4	N/A	
Business	16	10	N/A	
Government employee	11	6.9	N/A	
Non-government employee	19	11.9	N/A	
Household	83	51.9	N/A	
Education:				
Illiterate	42	26.3	0	0
Primary (I to V)	63	39.4	0	0
Secondary (VI to X)	28	17.5	03	5
Collage (XI to XII)	19	11.9	31	51.7
University	08	5	26	43.3

SAC – school-aged children
N/A – not applicable

Table 3. School-age children's knowledge about cause and risk factors of STH

Response	Total (n=131)	
	n	%
Source of information:		
Home/parents	36	27.5
Schools/teachers	65	49.6
Radio/television	23	17.6
Health workers	07	5.3
Social programs	15	11.5
Mode of transmission:		
Indiscriminate defecation	93	70.9
Vegetables are not carefully washed	40	30.5
Contaminated soil sources	76	58.1
Contaminated water sources	73	55.7
Walking barefoot	120	91.6
Put their hands in their mouths without washing	12	9.16
Do not remember	09	5.6
Causes of STH:		
Germs/Organism	44	33.6
Parasites	46	35.1
Contaminated foods/water	29	22.1
Do not remember	12	9.2

STH - soil-transmitted helminthiasis

contaminated water or foods while 12 (9.2%) did not feel able to give any answer (Table 3).

SCHOOL-AGE CHILDREN'S KNOWLEDGE ABOUT PREVENTIVE MEASURES OF STH:

Regarding practices of preventive measure, wearing of shoes is an important aspect in avoiding STH infections. In this study, 94.4% of the children reported that they wear shoes when going to the toilet while 57.5% children wear shoes always. Children who participated in this study were asked to mention their hand washing practice. 64.4% children said that they practice washing hands before and after taking meal and after defecation with soap and also reported having hand washing facilities at their home. The majority of the children (95%) mentioned they use sanitary toilets. 75.6% children mentioned that they took anthelminthic drugs. Only 7.5% children replied that they did not know anything about STH (Table 4).

SCHOOL-AGE CHILDREN'S KNOWLEDGE ABOUT MDA:

When asked, "Have you heard of MDA?" 121 (75.6%) respondents said they heard about the MDA and 39 (24.4%) respondent answered they don't know about MDA. Out of 121 children who heard about MDA previously, a good number of participants (40.5%) and (28.9%) thought the MDA aimed at preventing STH and preventing sickness respectively. Certain respondents also mentioned during the interview that MDA aimed at treating STH, treating sickness and also for improving health. 8.5% SAC mentioned that they don't know about the disease. Some children stated they did not know about MDA (Table 5).

ATTITUDE AND PRACTICES OF PARENTS OF SAC TOWARDS STH AND MDA

With regards to knowledge about STH or intestinal worm, out of the 160 participants, 104 (65%) respondents mentioned that they heard about this disease.

While asked about the seriousness of the disease, 85 (53.1%) mentioned STH as a serious disease for their children. 101 (63.1%) respondents believed that STH infection could be prevented by appropriate measures. Hence, regarding the main source of infection, 91 (56.9%) mentioned faces as the source of infection. While talking about MDA, 99 (61.9%) respondents stated they the heard about it. Forty-five (28%) respondents mentioned that they did not know about MDA and rest 16 (10%) said they did not remember about it. When asking about the importance of participating MDA, 91 (56.8%) mentioned that MDA participation is necessary for them while 60 (37.5%) respondents were confused about the importance of MDA. Only 9 (37.5%) mentioned that they did not think participant of MDA is necessary (Table 6).

PARENTS OF SAC KNOWLEDGE OF STH AND MDA

Regarding source of information, the three most common sources mentioned by the participants were health center/health workers (41.3%), school/teachers (25.9%) and mass media (18.3%). With regards to the parent's knowledge of

Table 4. School-age children's knowledge about preventive and control measures of STH

Control measures against STH		Total (n=160)	
		n	%
Use of toilets	In home	152	95
	In school	148	92.5
Wearing shoes	Always	92	57.5
	During using toilet	151	94.4
Taking drugs		121	75.6
Cutting nails regularly		82	51.2
Washing hand after defecation	With soap	103	64.4
	Without soap	57	35.6
Don't know		12	7.5

STH – soil-transmitted helminthiasis

Table 5. Understanding of SAC about objectives of MDA

Objectives of MDA	Total (n=121)	
	n	%
Prevention of sickness	35	28.9
Prevention of STH	49	40.5
Treat STH	11	9.1
Treat sickness	03	2.5
Improve health	13	10.5
Don't know	10	8.5

MDA – mass drug administration, STH – soil-transmitted helminthiasis, SAC – school-aged children

Table 6. Attitude and practices towards STH and MDA among parents of SAC

Response		Total (n=160)	
		n	%
Heard about STH/intestinal worm	Yes	104	65
	No	56	35
Is STH a serious disease?	Yes	85	53.1
	No	21	13.1
	Do not know	54	33.8
Believes that STH can be prevented	Yes	101	63.1
	No	08	5
	Do not know	51	31.9
Feces as a source of infections	Yes	91	56.9
	No	06	3.8
	Do not know	63	39.4
Heard about MDA for STH	Yes	99	61.9
	No	45	28.1
	Do not know	16	10
Is participation of MDA for STH is important?	Yes	91	56.8
	No	09	5.6
	Do not know	60	37.5

MDA – mass drug administration, STH – soil-transmitted helminthiasis, SAC – school-aged children

Table 7. Knowledge about causes and risk factors of STH among parents of SAC

Response	Total (n=104)	
	n	%
Source of information about MDA:		
Health center/health workers	43	41.3
Schools/teachers	27	25.9
Radio/television	19	18.3
Community program	11	10.6
Do not remember	04	3.8
Transmission:		
Dirty hand	23	22.1
Unhygienic toilet	29	27.9
Walking barefooted	51	49.1
Eating contaminated food	12	11.5
Drinking untreated water	05	4.8
Playing/contact with soil	09	8.7
Do not remember	17	16.3
Sign and symptoms:		
Diarrhea	51	49.1
Abdominal pain	32	30.8
Loss of appetite	14	13.5
Vomiting	07	6.7
Abdominal distention	24	23.1
Body weakness	29	27.9
Do not remember	16	15.4
Prevention:		
Hand washing after defecation	99	95.2
Wearing of shoes in toilet	102	98.1
Wearing of shoes when outside the house	77	74.1
Cutting nails regularly	54	51.4
Washing vegetables/fruit before eating	81	77.9
Taking anti-parasitic drugs	98	94.2
Avoid drinking untreated water	76	73.1
Do not know	13	12.5

MDA – mass drug administration, STH – soil-transmitted helminthiasis, SAC – school-aged children

transmission of STH, 49.1%, 27.9% and 22.1% respondents were mentioned walking barefoot, unhygienic toilet and dirty hands respectively as the main source of transmission. 17 (16.3%) parents however unable to mention the source for STH transmission.

The common sign of worm infestation mentioned by the parents was diarrhea (49.1%). A good number of the respondents indicated that abdominal pain (30.8%), body weakness (27.9%) and abdominal distention (23.1%) are signs of STH infection. When asked about how to prevent transmission of STH, the three most common measures mentioned by parents mentioned were wearing shoes in toilet (98.1%), hand washing after defecation (95.2%) and taking anti-parasitic drugs (94.2%) (Table 7).

SCHOOLS TEACHER'S KNOWLEDGE AND PERCEPTION ABOUT STH AND MDA

Regarding source of information, the most common sources mentioned by the school teachers were health center/health workers (53.3%). However, only 21.7% teachers mentioned that they got training about STH and 13.3% mentioned that they knew about STH from mass media including radio & television. With regards to the school teachers' knowledge of transmission of STH, a large majority (78.3%) and (68.3%) were aware that walking barefooted/playing with soil and unhygienic toilet are key modes. About half (51.7%) of the school teachers however indicated that lack of hand washing with soap is key modes of STH transmission. On knowledge of how to prevent infestation with STH, majority (96.7%) and (88.3%) of the school teachers mentioned deworming and health education. Observation of personal hy-

Table 8. Knowledge and perception of school teachers about STH and MDA

Response	Total (n=60)	
	n	%
Source of information about MDA:		
Training/workshop	13	21.7
Mass media	08	13.3
Health officials	32	53.3
Others	07	11.7
Transmission:		
Unhygienic toilet	41	68.3
Open defecation	17	28.3
Walking barefooted/Playing with soil	47	78.3
Lack of hand washing	31	51.7
Eating unwashed fruits and vegetables	11	18.3
Drinking untreated water	04	6.7
Sign and symptoms:		
Diarrhea/frequent toilet visit	40	66.7
Stomachache/Abdominal pain	37	61.7
Enlarged bell/Abdominal distention	29	48.3
Vomiting	08	13.3
Poor concentration/restlessness	10	16.7
Weak/malnourished body	28	46.7
Prevention:		
Taking anti-parasitic drugs	58	96.7
Hand washing	38	63.3
Health education	53	88.3
Wearing of shoes	28	46.7
Washing raw foods before eating	22	36.7
Avoid drinking untreated water	11	18.3

MDA – mass drug administration, STH – soil-transmitted helminthiasis

giene practices like hand washing, wearing of shoes and washing raw foods before eating were mentioned by school teachers 63.3%, 46.7% and 36.7% respectively (Table 8).

CONCERNS OF TEACHERS ABOUT MDA DRUGS

Although overall support was shown for teacher involvement in MDA, many of the teachers' responses showed concern about this idea. More than two third (68.3%) school teachers believed that MDA is very effective for STH prevention. Most teachers (71.5%) were found knowledgeable about side effects of MDA drugs. However, 61.7% teachers mentioned that they know how to manage side effects if any but 23.3% school teachers stated feared about side effects during MDA program (Table 9)

DISCUSSION

Soil-transmitted helminthiasis is still one of the most important public health parasitic diseases in Bangladesh. The present study is the first to provide information about the knowledge, attitude and practices (KAP) concerning STH in Bangladesh. Research has shown that any public health disease control interventions may fail if they are designed without understanding the perception and attitude of the target population.[12] It was also found from previous research that community knowledge and perception about the disease has been shown to motivate uptake of MDA.[3] Understanding community perceptions and practices are important to be able to address STH issues. A better understanding of the needs of the community and the potential contribution that the community could make towards the MDA program could support the national STH elimination program implementation team in creating a better community-based program using "a bottom-up" approach. In appreciation of this, the current study was premised on the fact that to design and implement optimal prevention and control strategies against STH to complement MDA, an in-depth understanding of the knowledge and practices of the target population as well as related stakeholders are essential. In this study, "knowledge" is defined as awareness of, familiarity with, or understanding about STH and MDA. "Attitude" was interpreted as the manner in which participants view STH and how this affects the way they might view the need for an intervention program like MDA. "Practice" was the customary and habitual way of the partici-

Table 9. Concerns of school teachers about MDA

Response		Total (n=60)	
		n	%
Is MDA is effective enough?	Yes	41	68.3
	No	19	31.7
Students willingly participated in MDA?	Yes	47	78.3
	No	08	21.7
I know what the side effects are.	Yes	43	71.7
	No	17	28.3
I know what to do if the student experiences side effects	Yes	37	61.7
	No	23	38.3
I am afraid of the side effects	Yes	14	23.3
	No	46	76.7

MDA – mass drug administration

pants' response to STH preventive activities and willingness to participate MDA.[13]

In this study, nearly one-fourth of the school-age children pupils had poor knowledge about STH and MDA and only half of the pupils had satisfactory knowledge regarding those. This study revealed that 81.9% of the respondents knew about the causes of STH whilst 75.6% knew about MDA. School-based MDA is going on since 2010 in the study areas. The present study was carried out in endemic areas active control program MDA is going on since 2010 by the National STH control project, which may explain why majority of the respondents had heard about the disease. Although the majority of the respondents had heard about STH, the results showed that awareness about the symptoms, ways of transmission and preventive measures among the participants did not reach to satisfactory level. This may be contributed to parents' poor knowledge regarding STH and may be due to the fact that a group of children especially non-school attending children had no lectures or demonstration on intestinal worm by their parents or community program. Several studied reported low level of knowledge among the target population which became the major obstacles for any control intervention.[7,8] Existing MDA in Bangladesh mainly based on school and most of the times, school attending children are mainly focused. There are no organize policy for non-school attending children or school leaving children or children who continue their study in other institutions except governmental primary schools or registered primary institutions. Some of that institution does not get tablet during the national deworming program. It will not be possible to achieve real impact with MDA without collaborating with this proportion of children. Local education office, as well as health office, should need to identify all of those institutions and should need to include urgently in national deworming program.

In this study, knowledge and awareness regarding STH was increased with educational level and socioeconomic status. Responses to the question on whether MDA was necessary for the respondents were not significantly different from school age children, parents of school-age children and school teachers where they thought that MDA was needed. This opinion was supported by a large majority of participants that they perceived the MDA for STH is needed but emphasized the importance of being educated more about the disease and also its prevention. Although there is some rumor about the drugs have side effects, awareness of this did not deter people from allowing their children to swallow distributed drugs. This maybe because the benefits of the drugs outweigh the barrier of side effects. But the source and spread of rumors, and how to mark them need to be contextualized.

According to results of the current study, there is moderate awareness among both parents and the school teachers about signs of STH infection such as diarrhea, abdominal pain, and weakness. Awareness among parents of school-age children found lower in this study. That may be due to several reasons; first the health education component of the control program may not be actively creating awareness amongst the community peoples. Secondly it may be contributed to only focus on schools, very fewer activities was found outside of schools. This finding is supported by the report of Masuva et al (2014) for KAP study on STH in Ethiopia who also reported moderate level of awareness regarding signs and symptoms.[13] However the present study results also indicate that there are misconceptions about the signs among parents. This shows a knowledge crevice that should be filled through health education training which is a vital piece of any disease control.

The participants reported having previously heard about STH from several sources including health workers, school, mass media, and community programs. Despite this, erroneous beliefs on the mode of transmission prevailed with participants associating it with unhygienic toilet, barefooted toilet using, lack of hand hygiene and contaminated food. This study demonstrated that two-third of the participants stated that they had known about STH from the health officials while the greater part of the school age children referred to the school and school teachers as the wellspring of their knowledge. Besides, the present investigation uncovered poor commitment from the media in Bangladesh, which ought to get legitimate consideration as involvement of the media is basic in the fight against this devastating disease. By and large, these findings are in concurrence with past investigations from different STH-en-

demic nations; a high level of awareness of STH has been reported in Malaysia and Ethiopia.[6,7,14]

The present study additionally shows that the parents of school age children and school teachers conscious that STH are transmitted through contaminated soil and unhygienic practices, for example, barefooted toilet use, absence of hand washing and open defecation. Parents as well as school teachers should be encouraged to promote hygienic practices such as proper latrine use to prevent environmental contamination and hand-washing among the school children. Be that as it may, Nyantekyi *et al.* (2014) revealed low attention to soil as a reason for contamination and prescribed execution of preventive chemotherapy, health education and promotion of utilization of sanitary toilet to the community to decrease STH infection.[14] Successful health promotion campaigns need to have interventions that put into consideration the behavior of the population being targeted similarly to what was earlier recommended in another study. Furthermore for consistent use of sanitary toilet in order to prevent environmental contamination, World Health Organization encourages provision of toilet that are in accordance with what already exists and is acceptable in the community.[1]

Current MDA in Bangladesh is mostly school-based and in all cases, school teachers distributed drugs among the target population that is school age children. Most of the school teachers stated that they do not have enough information and knowledge about the mode of action of distributed drug or management of adverse reactions if any. However, some school teachers mentioned that they had received training on drug distribution but the training was very short and hurriedly done. In this study, training of school teachers on good communication skills, the disease, and its prevention was found to be essential for the acceptance by communities and also for their motivation in conducting MDA. Distributors of drugs were not given adequate training on communication skills that would enable them to develop a good rapport as well as answer all questions about the program raised by children and also their guardian with confidence. Most parents agreed that if teachers were trained, they could administer medication without supervision; therefore, a training session for the teachers will likely help improve acceptability of MDA for the parents as this improves the confidence of the teachers.[15,16]

In Bangladesh, reaching the 2025 national target for STH elimination will require multi-sectoral collaboration and integration of the already effective control strategies. Further steps in this program will be to clarify misconceptions with education campaigns, train teachers to administer deworming medication, campaign for improved water and sanitation facilities, and appropriate policy of mass treatment in all target population. In order to achieve effective control of STH, these strategies must be implemented in synchrony, which will require cooperation from local community, health workers, teachers and increased public support.[17] Reducing the difficulties to the implementation process of MDA for STH would require adopting a framework thinking approach. This approach might be pertinent on the grounds that it requests watchful thought of conceivable results of different interventions through cooperation and collaborative thinking by important stakeholders. Strategic partnerships and collaborations are essential for successful implementation of MDA programs because it requires sustained political commitment from local communities. The involvement of various partners would help to consider in an iterative and efficient way fundamentally, the connections between MDA for STH and other components within the local health system. Key health systems components which could be considered include resources (health workers, finances, monitoring, follow up and information), health service delivery systems, administration or governance and also community norms and values.[18]

CONCLUSIONS

This study illustrated a good level of community knowledge, attitude and practices towards STH and its preventive measures. In spite of the fact that attitude toward STH control was to a greatly positive, lack of information about MDA and absence of health education still remain as a challenge to STH elimination. Community people need to be empowered with adequate information on STH and school-based deworming program. Community engagement in control intervention was detected as a major drawback for effective control, and intervention measures and information campaigns should focus on the community. Along these lines, there is an incredible requirement for a legitimate health education program and community sensitization so as to enhance disease control activities concerning the transmission and prevention of STH.

ACKNOWLEDGEMENTS

Our gratitude goes out to the respondents who took part in this study. Gratitude is also extended to the local education administration of Bangladesh for providing all types facilities for the conduction of the research. The authors wish to acknowledge to contributions of the Department of Public Health, Faculty of Medicine, University Gadjah Mada, Indonesia. This study was supported by a small grant from WHO/TDR to the Special Postgraduate Program of Implementation Research on Tropical Diseases training support initiative at University Gadjah Mada, Indonesia. The funder had no role in the study design, data collection, data analysis, or write-up of the paper.

FUNDING

None.

COMPETING INTERESTS

The authors completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf (available upon request from the corresponding author), and declare no conflict of interest.

CORRESPONDENCE TO:

Tilak Chandra Nath
Department of Parasitology
Sylhet Agricultural University
Sylhet-3100
Bangladesh
tilak1986.dvm@gmail.com

REFERENCES

1. World Health Organization. Eliminating soil-transmitted helminthiasis as a public health problem in children. Progress Report. Published 2012. Accessed September 18, 2017. http://www.who.int/tdr/publication/2012/

2. Hafiz I, Berhan M, Keller A, et al. School-based mass distributions of mebendazole to control soil-transmitted helminthiasis in the Munshiganj and Lakshmipur districts of Bangladesh: An evaluation of the treatment monitoring process and knowledge, attitudes, and practices of the population. *Acta Trop*. 2015;141:385-390. doi:10.1016/j.actatropica.2013.12.010

3. Benjamin-Chung J, Nazneen A, Halder AK, et al. The interaction of deworming, improved sanitation, and household flooring with soil-transmitted helminth infection in Rural Bangladesh. *PLoS Negl Trop Dis*. 2015;9(12):e0004256. doi:10.1371/journal.pntd.0004256

4. Banu SS, Ahmed B, Jubayer S, Banu SG, Ara K, Jamal KF. Prevalence of Soil Transmitted Helminths (STH) Infection among Children Aged 2-17 Years in Urban and Rural Areas of Dhaka District in Bangladesh. *Bangladesh Journal of Medical Microbiology*. 2011;5:16-22. doi:10.3329/bjmm.v5i2.16933

5. Family Health International (FHI)-360. Assessing progress in fighting STH in Bangladesh. Technical Briefs. Published 2015. Accessed September 18, 2017. https://www.fhi360.org/resource/technical-brief-assessing-progress-fighting-sths-bangladesh

6. Rahman MM. Biannually school-based deworming by Mebendazole 500mg has reduced the worm load drastically in Bangladesh. *EC Bacteriology and Virology Research*. 2016;2113-114. doi:10.19080/AIBM.2017.03.555617

7. Nasr NA, Al-Mekhlafi HM, Ahmed A, Roslan MA, Bulgiba A. Towards an effective control programme of soil-transmitted helminth infections among Orang Asli in rural Malaysia. Part 1: Prevalence and associated key factors. *Parasit Vectors*. 2013;6:27. doi:10.1186/1756-3305-6-27

8. Nasr NA, Al-Mekhlafi HM, Ahmed A, Roslan MA, Bulgiba A. Towards an effective control program of soil-transmitted helminth infections among Orang Asli in rural Malaysia. Part 2: Knowledge, attitude, and practices. *Parasit Vectors*. 2013;6:28. doi:10.1186/1756-3305-6-28

9. Liu C, Luo R, Yi H, et al. Soil-transmitted helminths in Southwestern China: A cross-sectional study of links to cognitive ability, nutrition, and school performance among children. *PLoS Negl Trop Dis*. 2015;9(6):e0003877. doi:10.1371/journal.pntd.0003877

10. Parikh DS, Totañes FIG, Tuliao AH, Ciro RNT, Macatangay BJ, Belizario VY. Knowledge, attitudes, and practices among parents and teachers about soil-transmitted helminthiasis control programs for school children in Guimaras, Philippines. *Southeast Asian J Trop Med Public Health*. 2013;44:744-752.

11. Khair M, Khanum H, Hossain M, Alam MS. Prevalence, risk factors and comparative diagnosis of soil-transmitted helminths in children of slum areas of Dhaka and tea garden areas of Sylhet. In: *Proceeding of the 12th Biennial Bangladesh Society for Parasitology (BSP) Conference. 2016*. Bangladesh Agricultural University.

12. Acka CA, Raso G, N'Goran EK, et al. Parasitic worms: knowledge, attitudes, and practices in western Cote d'Ivoire with implications for integrated control. *PLoS Negl Trop Dis*. 2010;4(12):e910. doi:10.1371/journal.pntd.0000910

13. Musuva RM, Omedo M, Secor WE, et al. Community knowledge, attitudes and practices on schistosomiasis in western Kenya-the SCORE Project. *Am J Trop Med Hyg*. 2014;90(4):646-652. doi:10.4269/ajtmh.13-0488

14. Nyantekyi L, Legesse M, Medhin G, et al. Community awareness of intestinal parasites and the prevalence of infection among community members of rural Abaye Deneba area, Ethiopia. *Asian Pac J Trop Biomed*. 2014;4(Suppl1):S152-S157. doi:10.12980/apjtb.4.2014c764

15. Cantey PT, Rout J, Rao G, Williamson J, Fox LM. Increasing compliance with mass drug administration programs for lymphatic filariasis in India through education and lymphedema management programs. *PLoS Negl Trop Dis*. 2010;4(6):e728. doi:10.1371/journal.pntd.0000728

16. Urbani C, Palmer K. Drug-based helminth control in Western Pacific countries: a general perspective. *Trop Med Int Health*. 2001;6(11):935-944. doi:10.1046/j.1365-3156.2001.00820.x

17. Hong ST, Chai JY, Choi MH, Huh S, Rim HJ, Lee SH. A successful experience of soil-transmitted helminth control in the republic of Korea. *Korean J Parasitol*. 2006;44(3):177-185. doi:10.3347/kjp.2006.44.3.177

18. Lammie PJ, Fenwick A, Utzinger J. A blueprint for success: integration of neglected tropical disease control programmes. *Trends Parasitol*. 2006;22(7):313-321. doi:10.1016/j.pt.2006.05.009