

Title of the article:

Feasibility of school-based health intervention for compliance of mass drug administration for soil transmitted helminthiasis in Bangladesh.

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Abstract:

Background: Mass Drug Administration (MDA) Programs has been conducting bi-annually at school level to eliminate Soil Transmitted Helminthiasis (STH) from Bangladesh since 2008. Because of very low MDA coverage in Bangladesh, this study explored the perceptions of stakeholders about MDA program implementation, knowledge of students regarding helminthiasis and MDA including its potential barriers.

Methods: 258 students of grade IV of three public schools from Khulna district, Bangladesh were randomly selected. This study follows mixed-method approach while Qualitative methods were used to evaluate the perception, barriers and favourable environment based on IDIs and FGDs with key stakeholders and quantitative method used to assess the students' response to School-Based Health Education (SBHE) intervention and knowledge of STH and MDA.

Results: In result, positive understanding and attitude towards MDA program are seen within community as well as have basic knowledge on STH. Rumour of drugs potential side effects and insufficiently trained manpower are found as key barriers. After SBHE intervention among urban and rural students' knowledge improved by 64.31% and 13.04% respectively including MDA coverage has increased by 40.08% and 8.69% respectively as well.

Conclusions: SBHE intervention improves knowledge, but to make that knowledge effective and sustainable, teachers need to get proper trainings on regular basis. Improved knowledge of the community can increase MDA coverage if we are able to remove the program obstacle like rumours of side effect of the medicine and constraints of skilled human resources.

Keywords: Mass Drug Administration; Soil Transmitted Helminthiasis; School-Based Health Education; Bangladesh.

Introduction:

The burden of neglected tropical diseases (NTDs) across the globe especially in developing countries is enormous; at least one NTD is endemic in 149 countries while hundreds of millions of people require treatment.^[1] Fifty percent of under nutrition is associated with intestinal parasitic infection or recurrent episodes of diarrhoea caused by insufficient water, sanitation and hygiene programs.^[2,3]

Bangladesh, being in the tropical zone and having all the risk factors of parasitic diseases, harbours the biggest disease burden. All 64 districts are endemic with 78 million infected with *Ascaris lumbricoides* (round worm) which constituted 55% of population. About 51 million people (35% of population) are infected with hook worm and 66 million people are infected with *Trichuris trichiura* (whip worm).^[4,5] Notably, children aged 5-14 years are mostly vulnerable to this infection.

Though, piloting de-worming program in 2005 resulted 79.8% of children were infected by either one or all three parasites, however, another survey found 18.65% with single, 4.91% with double, and 0.39% with triple infection.^[6] On the basis of that survey results, the government of Bangladesh estimated that twenty million children were at risk for STH.^[7] Moreover, Bangladesh has a higher prevalence of Anaemia (74 percent) while adolescent girls (43%) and pregnant women (49%) are the most vulnerable group. Though, data is limited, however, a recent study showed risk of anaemia was almost doubled (odds ratio = 1.87) in cases of hookworm infestation. ^[6] In addition, India is also fighting with great load of STH with a prevalence rate of *A. Lumbricoides* is 53% in Kolkata.^[8] Since, Khulna made the border with India, hence, it has a major impact on both countries trades and tourism including in transmitting several communicable diseases such as STH.

In response to initiate the elimination program, the Government of Bangladesh's Ministry of

Health established de-worming programs through the National Filariasis Elimination with the support of various partners including the WHO, Children Without Worms (CWW) and Johnson & Johnson. School based deworming program was scaled up gradually to 16 districts till 2006 to June 2007, 24 districts till May 2008 and finally it was expanded up to 64 districts by November 2008 with an aim to regular de-worming of 75-100% school aged children. In November round of 2008, the total targeted children aged 5-12 years were 15,743,159 amongst coverage was reported to 93.64% which rose to 99.39% in October 2015 round.^[9] Though, program data depicted very high levels of coverage, however, actual drug ingestion is less than reported according to the report of the post MDA validation survey organized by CDC Atlanta in 2010 in Munshiganj and Laxmipur districts. This study revealed that 69% of coverage of May 2009 for Munshiganj and 83% for Laxmipur, where some districts use total number of children having MDA drug as numerator and only school going children as denominator tends to increase the coverage rate over 100% for national data.^[10] Due to lack of National strategy, there is no fix way to count on the actual drug consumption, therefore some schools are providing total student list and distributing drugs to the students and also non-school going children, some schools count the leftover drugs and report everything else are ingested by the students.

Though health education is a part of the national curriculum, but the curriculum does not cover all diseases, so we found there is lack of information about STH and MDA in students' school curriculum. Rural area students getting health education, out of their curriculum, directly from their teachers, who are trained on certain health education interventions by Ministry of Health of Bangladesh. So, their knowledge level was higher on those certain diseases, hence, STH was one of the prioritized topics. Study suggested that a direct approach like health education intervention could be helpful for both students and their families for adopting healthy lifestyle.^[11] Research showed that collaboration with school and

government had much higher positive impact on deworming program which is also cost effective and sustainable because of active engagement of local community.^[12,13] Since, given curriculum of health education devoid of topics STH and MDA, so teachers in urban areas express their interest to get training on those topics for improving students' knowledge on related issues. Rural area teachers continuously received training from MoH yearly basis on specific health education intervention like STH, MDA, Vector borne diseases etc.

Although the program has been successfully rolled out, however, it has certain gaps and compliance issues that undermine the quality, hence, effectiveness.^[3,10] This assessment particularly focuses on providing the key factors that influence the achievement through stakeholder perspectives in a particular context; need to figure out recipient characteristics including potential barriers for scaling up.

Materials and Methods:

This study was planned to measure the “Feasibility” of health education intervention, also to explore the perceptions of stakeholders. This implementation research comprised of mixed-method approach (both quantitative and qualitative) using “Convergent (or Parallel or Concurrent) design”. The quantitative data collection part was school based and quasi-experimental survey. Khulna- one of the seven administrative division of Bangladesh was chosen purposively because of having low land and more inclined to natural calamities eventually contributed to the high prevalence of STH.

As study aims to measure feasibility of SBHE intervention in both urban and rural areas of Khulna, so required students of same grade. Rural school head teachers are entitled to deliver information regarding some selected SBHE (they got the training on these topics from Ministry of Health, periodically), but in urban schools no particular regulation of providing this information to the students. We selected Grade IV since they don't have exam pressure

like Grade V and elder than Grade III more conducive in participating research. All students of grade IV from selected schools were enrolled to the study who attended in a particular day. For quantitative part, three public schools; two schools (Khulna Govt. Girls High School and Khulna Zilla School) from urban area and Town Ghona Primary School from rural area were selected randomly. However, considering the absence of the students, missing/mismatch data rate 5-10% was acknowledged.

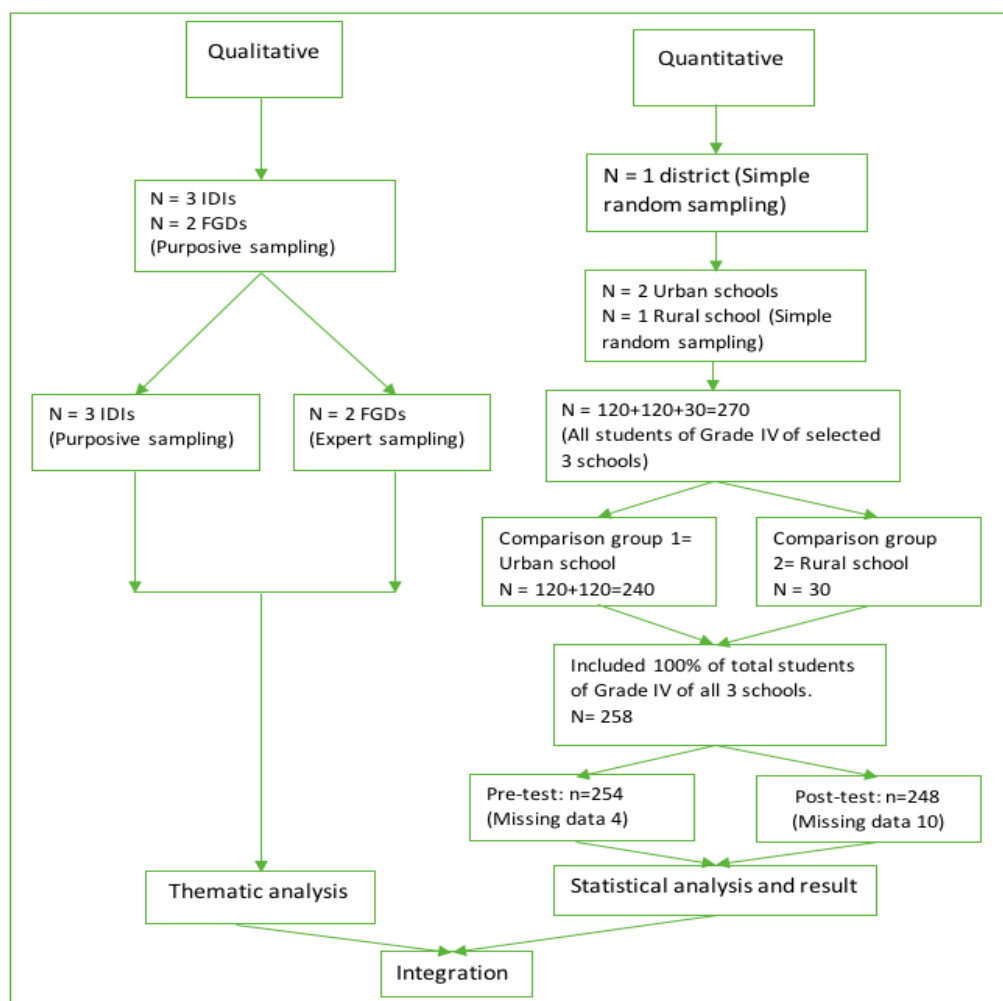


Figure 1: Sampling strategy

The questionnaire was pre-tested in a group of ten children and then revised before use. The questionnaire had questions on socio-demographic information (gender, age, religion,

parents' education and occupation, number of family members and number of siblings), questions on knowledge about STH and MDA (helminths transmission, sources, diagnosis, prevention, treatment, and benefits of MDA, rumours of MDA drugs) and questions on assessment of person's participation in previous MDA (intake of last dose of MDA, if not; why and side effects of drugs). Questionnaire was developed in Bengali by researcher herself based on the theme of a previous study on filariasis at Nepal.^[14] Two FGDs and three in-depth interviews were conducted.

Table- 1: Participant details of in-depth interview and Focus group discussion (FGD)

	In depth interview (n=3)			Focus group discussion (n=10)	
Person	School head teacher	Mother of a grade IV student	Program manager of Filariasis and STH control program	Teachers of grade IV	Guardians from parents of grade IV students
Number of participants	1 (female)	1 (female)	1 (male)	5 (2 female and 3 male)	5 (2 female and 3 male)
Level of education	M.Sc, M.Ed	M.Sc	Medical graduate	2 teachers M.Sc, B.Ed, 2 teachers BPH (Bachelor of Physical Health), B.Ed, 1 teacher M.Sc, M.Ed (who has SBHE training on STH control program)	Did not ask.
Duration of interview	30-45 minutes	30-45 minutes	30-45 minutes	45-60 minutes	45-60 minutes

“Inclusion criteria” for FGD candidates:

- Parents of grade IV students, chose randomly where parents of all students from 3 selected school were sampling frame.
- Teacher who have MDA, SBHE training was included in FGD purposively from the sampling frame who teach grade IV students.

Data Analysis

Qualitative research: Exploring the perception of the stakeholders related program including its barriers in implementing interventions collectively plays important role in identifying feasibility of proposed intervention. Data analysis was done based on the results of the transcription from in-depth interviews and FGDs. During coding, relevant segments of texts were labelled as perception, barriers, supportive environment, positive thoughts as the themes. Finally, encoding was done in interview questionnaire before interpretation based on given themes.

Quantitative research: Each questionnaire was checked for completeness every time after data collection. Final analysis for descriptive data was done by using STATA Version 13 (College Station, TX). Data was normally distributed applying K-S test for normality of the data with p-value less than 0.05 as a cut off point for statistical significance with 95% confidence interval. The primary outcomes - knowledge about STH and MDA and participation on MDA were measured by student t-test. For assessment of knowledge, STH and MDA related knowledge were measured using nine items. The participant's knowledge was scored using the scoring system applied in previous studies.^[15,16,17] Participants' responses regarding STH and MDA knowledge and information was categorized as '1 = yes', '2 = no' and '3 = don't know'. The recorded responses were then categorized into two grouping 'no' and 'don't know' as 0 and 'yes' as 1. But for "STH/MDA drug causes side effect?" and "Do you think, nausea, vomiting, stomach ache, dizziness, headache are the side effects of MDA drug?", 'yes' and 'don't know' as 0 and 'no' as 1. Furthermore, we calculated a total score of the nine items ranging from 0 to 9 which gives a total possible score of 9 points. The participants scoring 0-2 points was adjudged to have poor knowledge, those with 3-5 points having the average/moderate level of knowledge and those with 6-9 points to have high/good knowledge. The rate of knowledge score before and after the

intervention was assessed using the student t-test. The effectiveness of the intervention on bringing about change in the practice of drug uptake was done using Stuart Maxwell test. For measuring why students did not take MDA drugs, what they think about drug side effect, chi-square test was used. A set of dummy coded variable was created and a multiple linear regression was used to determine whether intervention had an effect on comparison groups (Urban and Rural) controlling for potential confounding variables.

Results:

Perception

Knowledge and awareness about STH and MDA

School authority, teachers and guardians had more or less knowledge about STH. They knew that helminthiasis is a communicable disease, caused by worm infestation. Proper handwashing, personal hygiene, wearing foot wears and medication can prevent STH infection. Usually they come to know about MDA by social media, government campaigns, newspapers, school etc. No one had any self-experience about side effect incidence, however, they have heard about rumours of side effect of the drugs from others and newspapers can cause mass panic-attack. Apart from that, all respondents came into a same decision that STH and MDA are highly related with person's self-awareness, social and educational aspects. As medicine comes with free of cost so there nothing like financial constraints. Moreover, this program or the drug do not hurt anyone's religious belief, so religion doesn't act as barrier.

School based health education

SBHE is a part of National academic curriculum. Students and teachers get knowledge about various infectious, communicable and non-communicable diseases from SBHE classes and

adopt the lessons in their daily life. Since, there are very scarce information about STH, that's why, students and parents have lack knowledge about STH. Though, few schools have teachers for health education with specific academic qualification, but they do not have any special training on SBHE. Since, students spend maximum time with teachers at school so effective health education may induce healthy practice, guardians opined.

Barriers and gaps

Table 2. Barriers and gaps identified from qualitative research

• Rumors of side effect of MDA drug	Rumors about side effect of the drug causes mass panic attack that become an issue which mainly spreads from media such as television, newspapers etc. Some people raised question about quality of the medicine since it is free of cost. Some others also think; it is a kind of human experiment so they do not want to be lab element of such trial.
• Trained manpower	Trained manpower is available at program level though, insufficient manpower at the frontline health service is the main obstacle of program.
• Monitoring and supervision of the program	Due to incommensurate of adequate master trainer, the primary training is still ongoing; monitoring, supervision of the training is yet pending.
• Timing	According to STH program manager, April round is much more effective than the October because schools, teachers, students everybody use to be very busy for preparing final (November, December) school examination.

Socio-demographic characteristics of participants:

The mean age of the participants from urban group was 9.98 years with (\pm SD 0.72 years) and 10 years with (\pm SD 0.58) was in rural group. Among total respondents, 50.39% were

boys and 49.61% were girls. Demographic characteristics were mostly similar in both groups except the social constraints in urban and rural settings.

Table 3. Knowledge of the students about STH and MDA in pre and post-test survey

Group	Pre-test		Post-test		Mean diff	Percent Change s	p-value
	Mean	SD	Mean	SD			
Urban	4.35	0.128	7.59	0.133	3.25	64.31%	0.00** *
Rural	6.75	0.395	8.54	0.147	1.79	13.04%	0.02**
Difference			-0.95		1.46		

*Student t-test

Mean knowledge of urban and rural students in pre-test were 4.35 and 6.75 respectively whereas in post-test, it rises sharply to 7.59 amongst urban students and 8.54 in rural students. Post-test mean difference between two groups was -0.95. Mean difference among urban students showed higher (3.25) in compare to rural group (1.79). Both groups showed statistically significant results in terms of mean knowledge following SBHE intervention, in which p-value among urban group of participants was highly significant (p 0.00). Hence, Rural group also showed significant outcome (p 0.02) though it was considerably lesser.

Table 4. MDA compliance among urban and rural students after intervention:

	Urban	p-value	Rural	p-value
Towards better compliance	40.08%		8.69%	
No change	49.77%	0.00***	91.30%	0.1573
Towards poor compliance	10.13%		0.00%	

*Stuart Maxwell test

Following intervention, 40.08% of Urban students showed better MDA compliance whereas only 8.69% of rural students moves to better compliance though 91.30% students expressed better knowledge at baseline.

Table 5. Reasons for students not taking of MDA drugs in April and November round

Reason for not taking MDA drugs	April round				November round			
	Urban		Rural		Urban		Rural	
	N	%	N	%	N	%	N	%
Absent at school on that day	73	32.58	0	0	42	18.75	1	4.16
Forgot to consume the drug	15	6.69	1	4.16	5	2.23	0	0
Fear of side effect	18	8.03	0	0	8	3.57	0	0
Lack of awareness	5	2.23	0	0	2	0.89	0	0
Improper counselling	15	6.69	0	0	6	2.67	0	0
Other reasons	10	4.46	1	4.16	1	0.44	0	0

*Chi-square test

32.58 percent of urban students did not consume MDA drugs because they were absent at school on that particular day and 8.03% because of fear of side effect at April round. After intervention, these percentages reduced to 18.75% and 3.57% respectively.

Table 6. Perception of students about Side effect of MDA drugs in pre and post-test

Side effect	Pre-test				Post test			
	Urban		Rural		Urban		Rural	
	N	%	N	%	N	%	N	%
Yes	82	35.81	2	8.33	21	9.17	0	0
No	71	31.00	22	91.67	165	72.05	24	100
Don't know	76	33.19	0	0	43	18.78	0	0

*Chi-square test

Majority of students in rural area opined MDA drugs have no adverse effects, however, only one-third of urban students given similar answer. In post-test, the changes were remarkable, approximately 72% urban students replied correctly about no side effect whereas in case of rural students it was 100%.

Discussion:

The aim of this study was to assess the feasibility of school-based health education intervention for compliance of mass drug administration of soil transmitted helminthiasis in Khulna district, Bangladesh. Quantitative part of the research proved that SBHE intervention has significant impact on students' knowledge and MDA drug consumption. Those who got regular health education intervention had a higher level of knowledge ($p < 0.05$) regarding STH and MDA in compare to those who got only once. Hence, qualitative part of this study provides supporting evidences in order to prove the effectiveness of intervention given. ^[18] In addition, stakeholders affirmed regarding necessity of teacher's robust engagement in School based health education program. Hence, conducive attitude of program implementers and interest of both teachers and students are identified as key operational factors. Insufficient staffs at frontline health service and lack of training for school teachers are the major hindrances of implementing program.

Response of the participants

Changes in both knowledge and practice found dramatic in this study following intervention amongst both group of respondents. A quasi-experimental research in Southern State proved that the students who had school curriculum on health and nutrition had significant improved

knowledge which reflected their day to day health practice.^[19] Similar impact we observed in rural group, who were getting health education intervention on regular basis, had greater knowledge score in both pre and post-test whereas in urban group, who got intervention just once, had significant changes in post-test knowledge score proved that the positive response of the participants to our intervention and medicine intake. Gao et al. (2012) argued that misconceptions about diseases, its treatments, side effects of the drugs, improper knowledge can be demystified by direct health education intervention.^[20] A study in rural Bangladesh showed, only 28.8% of adolescent girl had good menstrual hygiene practice during pre-test but after intervention it rose to 60.1%.

Awareness about health enhance peoples' health seeking behaviour to improve their health condition. Following intervention, knowledge score sharply increased among urban and rural group by 60% and 13% respectively. Since, rural students received health education intervention by trained teacher for one year therefore baseline knowledge level was higher (87.50%) compare to urban students (27.39%). During post-test, though all participants in rural group showed improved knowledge on STH and MDA, however, change wasn't significant (p 0.11), in contrary, urban group yielded highly significant result (p 0.00). As because, both groups reported better understanding on STH and MDA after SBHE evidently shown that health education intervention is highly effective for improving knowledge about disease transmission, sign-symptoms and treatment. All participants belong to same age range, although, socio-cultural background and religion were different which considered important predictor of knowledge and practice.^[21-24] This study revealed that ethnicity, education and religion didn't influence on knowledge level. Also, study showed change in practice after the education intervention can be sustained for a longer time.^[25]

Barrier and gaps of the MDA compliance has educed from this study where main reasons for not taking MDA drugs been identified fear of side effects, forgot of consume, improper

counselling and lack of awareness. Participants also stated may be some children got stomach ache or dizziness after having MDA drug if takes on empty stomach, however, this news become rumour and causes mass panic attack.

Focus group discussion suggested that rumour of drug's side effects was broadcasted by media like television, radio with great emphasis, but steps taken by both government and private media which can assure people that the drug has no side effect. In both of our qualitative and quantitate studies reported that there were lots of misconception about the knowledge of STH and the drug of MDA because of proper information. Discussion with community members also revealed SBHE was very helpful way to understand about diseases and to clear their confusion about the treatments and side effect of medicine.^[26]

According to participants' opinion, teachers play as key drivers for sustainability and better outcome of SBHE program because students spend at least five to six hours at school. Moreover, school-based health education program undoubted is a cost-effective way.

According to our research, all participants get into a same decision that STH and MDA is highly related with person's self-awareness, social and educational aspects. This study identified lack of human resources, insufficient training for teachers, very few information on the specific topic, lack of collaboration with parents and teachers and rumour misunderstandings are the main barriers for the program success.

Due to lack of insufficient master trainers, program decided to train teachers on area wise. At the initial stage, MDA program was only conducted to the rural areas of Bangladesh, so now rural area teachers are getting the training, step by step. Due to incommensurate of adequate master trainer, the primary training is still on going.

Our research findings showed the presence of interested and motivated teachers and students who were willing to teach and learn about healthy behaviour. We can also say that, to make

any program successful, it should be a priority both by the implementing institution and the program itself.^[27,28]

Conclusion:

This study was not generalized and it had time limitation, we could not prevent the external influence to the intervention and recall bias during the data collection and our two comparisons group had differ in few characteristics. Nevertheless, SBHE intervention improves knowledge, but to make that knowledge effective and sustainable, teachers need to get proper trainings on regular basis. Improved knowledge of the community can increase MDA coverage if we are able to remove the program obstacle like rumours of side effect of the medicine and constraints of skilled human resources.

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Conflicts of interest: None

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