

Revisiting the ARI Programme of BRAC: How Well are We Doing?

Qazi Shafayetul Islam
Syed Masud Ahmed
Mohammed Abbas Uddin Khan

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Telephone: (88-02) 9881265-72, 8824180-7 (PABX)
Fax: (88-02) 8823542
Website: www.brac.net/research

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List of acronyms

ARI	Acute Respiratory Infection
GoB	Government of Bangladesh
IEC	Information, Education and Communication
MNCH	Maternal, Neonatal and Child Health
NGO	Non-government Organization
NIPORT	National Institute of Population Research and Training
PO	Programme Organizer
RED	Research and Evaluation Division
SK	<i>Shasthya Kormi</i>
SS	<i>Shasthya Shebika</i>
SSC	Secondary School Certificate
UNICEF	United Nation Children Fund
WHO	World Health Organization

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Abstract

The ARI (Acute Respiratory Infection) control programme of BRAC has been in operation for the last few years. No independent evaluation has so far been conducted to explore how far the objectives of the programme have been achieved in terms of raising awareness among the health workers and community people, especially mother/caregivers about ARI, increasing capacity of health workers in managing ARI cases in the community, and changing health-seeking behaviour of mothers for appropriate and quick treatment. This is a cross-sectional population-based study comparing groups with or without ARI programmes. The study was conducted in 30 *upazilas* where BRAC ARI control programme is being implemented since 2007. In addition, 10 *upazilas* were selected from adjacent programme areas to serve as control. The study included 2,800 mothers, 1,440 children with ARI symptoms, and 238 community health workers who were actively involved in the implementation of the ARI programme. The *Shasthya shebikas* (SS), frontline workers of BRAC, appeared to have insufficient knowledge about ARI, its prevention and other related information. Similarly, the level of awareness among mothers in terms of recognition of symptoms of ARI and its prevention remains inadequate. However, the awareness was higher in programme areas compared to non-programme areas. The majority of the mothers heard about the community-based BRAC ARI control programme, but they were unaware about the detail activities of the programme. The overall management of ARI with respect to diagnosis and treatment by the health workers especially SSs was not up to the expected level. They did not count the rate of respiration regularly while diagnosing different stages of pneumonia. The SSs did not tell mothers about the doses of co-trimoxazole syrup in many cases, and about the danger symptoms and signs, and prevention of ARI further. Sixty percent of mothers would not seek ARI treatment from BRAC in programme areas. Mothers preferred to go to the village doctors and drug sellers in both the programme and non-programme areas. During health-seeking, one-fourth of the mothers did not seek treatment, and one-fourth received spiritual treatment. The knowledge of BRAC SSs and the mothers was not enough to deal with ARI management. Thus, it is difficult to expect quick management of ARI to save life of the children in the community. Many mothers still sought treatment from unqualified providers. Furthermore, the quality of management by BRAC SSs was not of expected level. So, we conclude that many children were at risk of mortality due to ARI. BRAC ARI programme should look into the matter seriously to achieve the programme goal, and to reduce child morbidity and mortality.

Executive summary

Acute respiratory infection (ARI) is one of the main public health problems in under-five children in Bangladesh. It is estimated that around 400 children die of ARI in a day and about 145,000 in a year in Bangladesh. It is no matter to save children's lives, if appropriate and quick management of ARI is initiated.

BRAC, an indigenous Bangladeshi non-government organization (NGO), started community-based ARI control programme in 2007 for quick management of ARI at home by community health workers. The programme is building awareness of mothers of under-five children about ARI and changing their health-seeking behaviour for appropriate treatment in 40 districts of Bangladesh. Furthermore, *Shasthya Shebikas* (SS) or the community health workers of BRAC directly identify and treat children with ARI during their routine household visits. So far, no independent evaluation has been conducted to explore how far the objectives of the programme have been achieved in terms of raising awareness among the health workers and community people, especially mother/caregivers about ARI, increasing capacity of health workers in managing ARI cases in the community, and changing health-seeking behaviour of mothers for appropriate and quick treatment. The study also addressed the consumers' satisfaction with services. The information would be helpful for strengthening the programme further if necessary.

This is a cross-sectional population-based study comparing groups with or without ARI programmes. The study was conducted in 30 *upazilas* where BRAC ARI control programme is being implemented since 2007. In addition, 10 *upazilas* were selected from adjacent programme areas to serve as control. The study included 2,800 mothers, 1,440 children with ARI symptoms, and 238 community health workers who were actively involved in the implementation of the ARI programme.

Key findings

Knowledge

- The frontline workers (SS) of BRAC appeared to have insufficient knowledge about pneumonia, its prevention and other ARI related information.
- Similarly, the level of awareness among mothers in terms of recognition of symptoms of ARI and its prevention remains inadequate. However, the awareness was higher in programme areas compared to non-programme areas.
- The majority of the mothers heard about the community-based BRAC ARI control programme, but they were unaware about the detail activities of the programme.

Findings from training observation

- The venue of the training session for the community health workers (CHW) was not suitable. The venue was not spacious, and the noise in the classroom distracted attention of the participants. On the other hand, illiterate health workers often could not read the content of training materials. Thus, majority of them tried to learn by memorizing without proper understanding of the contents. There was lack of active engagement of the CHWs while discussing a problem.

Disease management by providers

- The overall management of ARI with respect to diagnosis and treatment by the health workers especially SSs was not up to the expected level. They did not count the rate of respiration regularly while diagnosing different stages of pneumonia. Frequently, they did not ask the age of children for adjusting the dose of co-trimoxazole while administering medicine. The SSs did not tell mothers about the doses of co-trimoxazole syrup in many cases, and about the danger symptoms and signs, and prevention of ARI further. The study also explored that a great majority of SSs did not have co-trimoxazole syrup to treat pneumonia instantly in programme areas.
- Village doctors, drug sellers, etc. did not follow the standard guideline for treating pneumonia or ARI in both programme and non-programme areas. They often prescribed different kinds of antibiotics rather than WHO-advised medicine (co-trimoxazole).
- Whatever the services provided by the SSs, and other providers, the mothers were found to be fully satisfied with their services.

Health-seeking behaviour of mothers

- Significant proportion of mothers (60%) would not seek ARI treatment from BRAC in programme areas. Mothers preferred to go to the village doctors and drug sellers in both the programme and non-programme areas. The mothers perceived that the village doctors (52%), and drug sellers (21%) could manage the disease better than the SSs.
- During health-seeking, one-fourth of the mothers did not seek treatment for their sick children as they waited for natural recovery. Although, allopathic treatment was well-known to the mothers, one-fourth received spiritual treatment in addition. The family members forced them to receive spiritual treatment.
- Regarding using BRAC services, the mothers would like to get free medicine (54%), and to get services from qualified doctors of BRAC (42%) rather than the SSs.

Conclusion

Both the *Shasthya Shebikas* and the mothers possessed superficial knowledge about different aspects of ARI. The management of ARI treatment by health workers was not up to the expected level in the programme areas. The mothers often went to village doctors, drug sellers, rather than going to BRAC for taking treatment. The main reason was the mothers were unaware about details of BRAC ARI programme. However, the mothers intended to get free medicine, and to get services from qualified doctors of BRAC.

Programme implications

1. BRAC programme should create adequate environment for learning, and provide effective training materials for better understanding of SSs. The weak categories of health workers should be identified, and special care should be taken for their training.
2. Programme efforts in raising knowledge seemed to concentrate in identifying few clinical symptoms and preventive measures. More emphasis should be given for a comprehensive understanding of symptoms and signs of ARI including preventive measures for better management and seeking treatment early. The programme could focus on germ theory of pneumonia through interpersonal communication. This could reduce delay to accept the medical diagnosis of ARI from formal places.
3. The spiritual practice was common and forced by the family members. This may delay in seeking medical care. Thus, programme should motivate the family members to take treatment from formal place like BRAC. The spiritual healers should also be motivated for early reference. The informal providers such as village doctors and drug sellers are also the big players in the treatment of pneumonia. Programme should work with them. They should be included for IEC intervention of programme. So that they could follow WHO guideline for ARI treatment or they could refer patients to BRAC or other formal places quickly. Signboard of treatment place (BRAC) should be fixed in the villages, so that the mothers could go to the places quickly.
4. The BRAC programme should increase the contact with community people through interpersonal communication to break the misperception regarding BRAC ARI services.
5. Good supervision should be established to ensure the availability of medicine with health workers so that every child with pneumonia could get co-trimoxazole.

Introduction

Acute Respiratory Infection (ARI) is one of the main public health problems in under-five children in many developing countries including Bangladesh (Harrison *et al.* 1995, Redd *et al.* 1994, Gupta *et al.* 1996, Harari *et al.* 1991, Zaman *et al.* 1997, Baqui *et al.* 1998, Piechulak *et al.* 2003). It is estimated that around 400 children die of ARI in a day (GoB 1995, Denno *et al.* 1994: Zaman *et al.* 1997) and about 145,000 in a year in Bangladesh. It is no matter to save children's lives, if appropriate and quick management of ARI is initiated (Mull *et al.* 1994). Early care-seeking is very crucial in this regard but mothers/care-givers often fail to do so (Cardenas *et al.* 1992) due to lack of awareness of the signs and severity of ARI in many societies (Nichter 1994, Muhe 1996, Saini *et al.* 1992). Thus, UNICEF and WHO (World Health Organization) emphasize to promote maternal knowledge about the prevention of ARI at community level (Aung *et al.* 1994) including management of ARI by health workers where facilities are beyond quick reach in developing countries (WHO 1984). It was found that if only the fast breathing and chest in-drawing are timely identified, most ARI deaths can be averted (Mull *et al.* 1994).

Like others, the government of Bangladesh (GoB) and non-governmental organizations (NGO) have been working to reduce the prevalence of ARI among under-five children. BRAC, the largest NGO in the world, involved the community health workers (*Shasthya Shebikas* or SS) in 10 *upazilas* (in the northern and central regions of Bangladesh) as front-line workforce¹ to identify and treat ARI in a pilot project in the 1990s (BRAC 1997). Findings from this pilot experiment confirmed that the SSs were capable of identifying and diagnosing children with ARI, and referring them effectively to the health facilities (Hadi 2003). BRAC intended to use this experience to implement a community-based ARI control intervention through its network of *Shasthya Shebikas* (SS) who are already providing essential health services to the community (Ahmed 2008).

The ARI programme

In 2007, BRAC started community-based ARI control programme in eight northern districts of Dhaka and Rajshahi divisions and extended to another 12 districts in 2008. Currently, BRAC is implementing ARI control programme in 40 districts. In ARI programme, each SS receives extensive three-day basic training under the supervision of para-professionals experienced in managing and treating ARI. The contents of training are symptoms and signs of ARI, examination of ARI cases, counting rate of respiration, treatment guideline (national guideline) and referral of severe and very severe forms of ARI to the nearest public health facilities. They also receive one-day refresher training every month, which includes ARI to reinforce their

¹ A woman who provides basic healthcare services in the community

knowledge. The SSs regularly visit households in their catchment areas to screen out the under-five children with ARI symptoms. After detection of the disease, the SSs treat children with advice, medicines, or send them to hospital if required. In addition, they disseminate relevant information to mothers of under-five children at household level. Mothers are taught to recognize signs and symptoms of ARI including pneumonia and told how and where to obtain treatment. The community awareness, case identification and management of ARI by *Shebikas* (SS) are closely monitored by the *Shathya Kormis* (SK-the paid health cadre of BRAC). Programme organizers (PO) and *upazila* managers also monitor the activities of SSs to some extent and document the disease outcomes.

Rationale

The community based ARI programme has been in operation for the last two-three years. The main objectives of the programme are to reduce the morbidity and mortality of ARI among under-five children in rural community through SSs. Following the 'success' of the programme, BRAC expanded its services in 40 districts. So far, no independent evaluation has been conducted to study the effectiveness of the programme. It is imperative to explore how far the objectives of the programme have been achieved in terms of raising awareness among the community health workers and people especially mother/care-givers about ARI, increasing the capacity of SSs in managing ARI cases in the community, changing health-seeking behaviours of mothers for proper medical care, and providing satisfactory services. The findings would help fine-tuning the programme further in terms of resource allocation, programme modifications, etc., and provide a benchmark for future impact assessment.

General objectives

This study aims to see the effectiveness of the community-based ARI programme of BRAC among the under-five children.

More specifically, the study aims to investigate:

1. The training environment for learning ARI information,
2. Knowledge and practice of BRAC *Shasthya Shebikas* and *Shasthya Kormis* about the diagnosis and treatment of ARI in under-five children,
3. Challenges faced by the SSs in implementing the BRAC ARI control programme,
4. Knowledge and health-seeking behaviour of mothers regarding ARI in under-five children,
5. Perception, satisfaction and expectation of the mothers/care-givers about BRAC ARI programme including constraints to service utilization and suggestion for improvement.

Materials and methods

Study settings

This is a cross-sectional study, mainly population-based survey comparing groups with or without ARI programme. It was conducted at *upazila* level where BRAC ARI programme is being implemented in eight districts since 2007 using the SS-based infrastructure. Both quantitative and qualitative tools were used for data collection.

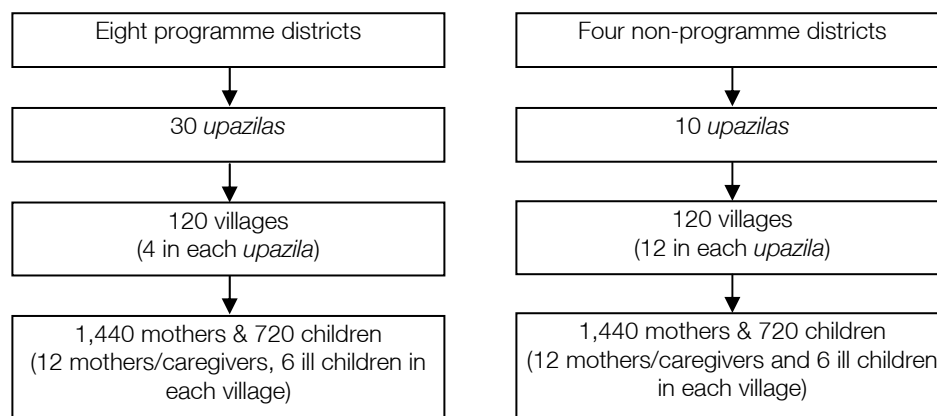
Study population

The study respondents were of three categories: i) mothers/care-givers having children <5 years ii) children <5 years with ARI symptoms (last 15 days), and iii) healthcare providers of BRAC such as SSs, SKs, and POs.

Sampling and sample size

Thirty *upazilas* were selected randomly from the eight programme districts (where ARI programme started in 2007) and 10 *upazilas* from adjacent non-programme districts (Fig. 1). Four villages were selected randomly from each programme *upazila* and 12 villages from each non-programme *upazila*. From each village, 12 women and 6 children with ARI symptoms were randomly selected. Thus, a total of 2,880 mothers, and 1,440 children with ARI symptoms were included in the study (Fig. 1). A sample of 238 *Shasthya Shebikas* (119 from each programme and non-programme areas), and 217 *Shasthya Kormis* (SK) and 223 POs were also included in the study. The mothers and children were calculated on the basis of $p=0.5$, 5% significance level, 80% precision, a design effect of 1.5, and non-response of respondents.

Figure1. Sampling procedure for programme and non-programme areas



Tools development

Structured and semi-structured questionnaires were developed based on programme guidelines to collect data. Five training sessions for SSs were observed to explore the learning environment. All the questionnaires were pre-tested in a village outside our sample for ascertaining consistency, appropriateness of languages, sequencing of questions, and to have an insight into the field operation procedure. The final questionnaire was modified and updated on the basis of field-testing.

We collected information on the following variables:

For healthcare providers,

- 1) Basic profile of healthcare providers, 2) knowledge and practice of healthcare providers on ARI, 3) availability of ARI medicines with providers for managing ARI, 4) revision of documents related to ARIs treatment, and 5) documentation of the lists of challenges faced by the providers (SS) in ARI management. Two checklists were developed for observing the training sessions organized for *Shebikas* and management of treatment in the community by consulting programme managers. The checklist for observing practice or management in the community is given below (Table 1):

Table 1. Observation indicators on ARI management

	Yes	No
Illness history		
SSs ask the age		
Ask about fever		
Ask about cough		
Ask about the duration of cough		
Ask about fast breathing		
Ask about breast-feeding		
Ask about the ability to drink		
Ask about the convulsion		
Diagnosis		
SSs measure fever by hands		
SSs count rate of respiration		
SSs observe chest in-drawing		
SSs take initiative to hear about noisy breathing		
Treatment		
SSs give advice		
SSs give paracetamol syrup (acetaminophen)		
SSs give co-trimoxazole syrup (anti-bacterial)		
SSs give histacine syrup (antihistamine)		
Advice		
SSs tell the doses of medicine		
SSs tell danger symptoms and signs of ARI		
SSs tell to drink plenty		
SSs tell to prevent ARI further		

For mothers/care-givers and children

- 1) Socio-demographic profile of mothers/care-givers; 2) knowledge of mothers/care-givers on causation, symptoms and clinical signs, prevention and treatment, available facilities for treatment, etc. with respect to childhood ARI; 3) knowledge on BRAC's ARI programme; 4) health-seeking behaviour for childhood ARI; 5) barriers in seeking ARI treatment; and 6) perception about BRAC ARI programme services, expectations from the programme, and suggestions for improvement.

Table 2 presents the ARI-related information that programme provides to the health workers in the training sessions and refresher training sessions for management of children with ARI.

Table 2. Information on ARI disseminated to CHWs by the programme at training sessions

Pneumonia	Lung infection
Detection of pneumonia	presence of cough or respiratory distress with rapid respiration
Respiration rate in pneumonia	
<2 months	60 or more/min
2 -12 months	50 or more/min
1-5 years	40 or more/min
Treatment with co-trimoxazole	
2-12 months	1 teaspoon twice daily for 5 days
1-5 years	2 teaspoon twice daily for 5 days
Prevention of pneumonia	Breast-feeding upto two years start weaning food after 6 months take adequate nutritious food bath is restricted immediate after delivery immunization according to age coverage of vitamin A upto 5 years maintain adequate personal hygiene
Factors could increase the incidence of pneumonia	cold weather under-weight at birth (<2.5 Kg) bath immediate after delivery if the baby is not given colostrums if the baby is given complimentary diet before 6 months if the baby is suffering from under-nutrition if the baby is not given vaccines according to age
Child is required to refer hospital	during the condition of fast breathing (≥ 60 /min) in chest in-drawing noisy breathing unable to drink unconsciousness high fever if the baby is suffering from convulsion excessive vomiting
Have to advice in pneumonia	Keep children in warm environment clean child's nasal passage regularly feed breast milk frequently take plenty of drinks (>6 months) go to hospital if require or emergency situation take adequate food upto 14-day

Table 3 lists the information on ARI that the health workers provide to the community people, so that they could recognize the symptom and signs of ARI quickly, and seek help from appropriate places.

Table 3. Information delivered by health workers in the community

Sign and symptoms of ARI	Fever Cough and cold Fast breathing Noisy breathing Chest in-drawing Unable to drink Convulsion
Prevention of ARI	Breast-feeding Personal hygiene Safe environment Proper diet Vitamin A supplementation Immunization
Available ARI treatment service	Local BRAC/health worker

Data collection

Skilled interviewers (consisting of science graduates having field experience, and some anthropologists) were recruited. A five-day intensive training was organized for them consisting of lectures, mock interviews, role play and field practice at community level. One-day hospital training was given to the interviewers on how to identify children with ARI. Field trial was done in villages with ARI programme (outside our study areas). Training manual was developed to guide the interviewers in the field. Five teams were formed for data collection, each consisting of one supervisor and four interviewers. Before the actual survey, the team was deployed in the study villages one day before the beginning of the survey for rapport building and for household listing. During this time, the villagers were informed about the purpose and activities of the survey and sought their cooperation. The interviewers entered into the study village and identified households with mothers having under-five children and sick children with ARI symptoms. A child was considered as having ARI if the mother reported that the child had cough during the preceding two weeks along with any one of the four symptom of: i) cold, ii) short, rapid breathing, iii) difficulty in breathing, and iv) chest in-drawing (NIPORT 2005). We included children in the study who suffered from ARI within the last 15 days to reduce recall bias. All mothers/care-givers and children were listed in the end of screening. Required numbers of children and mothers were selected randomly from each village for interview. Households were visited on three repeated occasions at intervals if the first attempt was not successful. We used registers to find out the concerned BRAC health workers and their addresses. The field activities were supervised by the researchers.

Ethical issues

The study was approved by Research and Evaluation Division (RED) of BRAC. The institutional ethics committee does not have to be consulted as no intervention is involved. All respondents were informed that their responses would remain anonymous, and verbal consent was obtained.

Analysis

Data entry and cleaning was done at Dhaka head office under the supervision of the principal investigator and analyzed by SPSS version 16.0. Comparison was done between programme and non-programme areas to see difference. χ^2 (chi square) test was done to find out the statistical significance.

Results

Findings from training observation

Five training sessions of ARI were closely observed by anthropologists. The findings are briefly summarized below:

1. The training environment was not comfortable for participants as reported by the *Shasthya Shebika*. For examples, training room was not spacious to accommodate 15-17 participants. The participants used mobile phone frequently during the training sessions that distracted the attention of the participants. They went out of the training sessions repeatedly without permission of the trainers. In addition, noise from market often made them inattentive. One participant reported, "It is difficult for me to listen to all messages with full attention. The place is in the market and quite noisy."
2. The duration of training (2.5 days) was insufficient as reported by majority of the participants. One participant reported, "I think the duration of training should be more than 2.5 days. I tried to learn by memorizing without understanding some issues."
3. The training materials were found not effective to a large portion of the participants. Majority of them were illiterate, and were unable to read the training materials. Participants reported that these materials did not have pictures on topics to help participants to imagine. They also reported that the video on ARI was hazy, the sound was often unclear, and the video was often interrupted by load shading. Trainer often talked to the participants in formal language. So, the participants could not understand sometimes.
4. The participants who answered well in the training session were encouraged by the trainers than who could not answer. Even, the trainer misbehaved with the participants who failed to answers. Most of the participants did not participate in practical demonstration (how to measure fever, count the rate of respiration, and others).

Profile of BRAC health workers

The average age of SSs (40 years) was higher compared to SKs (28 years) and POs (31 years) (Table 4). One-third SSs never attended school. Very few of them passed Secondary School Certificate (SSC), whereas almost all SKs and POs passed SSC (97-100%). The SSs had more than 5 years of work experience. More than 90% of SSs and SKs in programme areas received training on ARI, and majority of them (80-87%) also attended refresher training regularly. The SSs usually consulted around 5 children with ARI symptoms in the last three months in programme areas.

Table 4. Profile of BRAC health workers by study areas (%)

	SS			SK			PO		
	ARI	No ARI	All	ARI	No ARI	All	ARI	No ARI	All
Age (mean)	39.8	39.6	39.7	27.4	28.06	27.9	30.2	31.6	30.8
School education									
No	36.0	30.0	33.0						
Primary	25.0	30.0	28.0	0.0	1.0	0.5			
Secondary	31.0	26.0	29.0	2.0	3.0	2.0			
Above SSC	8.0	13.0	11.0	98.0	96.0	97.5	100.0	100.0	100.0
Work experience (in years)	5.48	5.72	5.60	2.76	3.42	3.10	4.88	6.33	5.40
Received training on ARI	93.0	9.0	52.0	91.0	3.0	50.0	73.0	9.0	43.0
Attended refresher training	95.0	78.0	87.0	89.0	70.0	80.0	24.0	16.0	20.0
Consulted ARI patients in last three months	4.8								
N	119	119	238	115	102	217	116	107	223

Health workers' knowledge about ARI

Knowledge of health workers about ARI was presented in Tables 5-8. Initially, they were asked to define pneumonia (Table 5). Majority of SSs (49-50%) defined pneumonia as the disease of fast breathing and of cold. However, SKs defined it as the disease of respiratory tract and lung infection (49%).

Secondly, health workers were asked about the main cause of ARI. Knowledge on germ cause of ARI was nil among them (Table 5). However, exposure to cold weather was universally known cause of ARI among SSs (84%), SKs (75%) and POs (63%). Thirdly, they were asked about the factors that could increase the incidence of ARI. Majority (83-87%) mentioned about cold weather (Table 6). However, underweight, inadequate diet, under-nutrition, un-immunized condition, etc. were not mentioned frequently.

They were also asked about the preventive measures of ARI. The overall knowledge of health workers remained superficial (Table 6). Only three preventive measures such as protection of children from cold weather (67-82%), good hygiene practice (64-71%), and breast-feeding upto two years (46-68%) were well known. Even, health workers could not tell some major conditions when a child would require emergency ARI management at hospital to save life. They mainly reported about one out of five major situations. It was the situation of chest in-drawing (77-96%) (Table 7).

Table 8 shows the knowledge on the rate of respiration in identifying pneumonia among under-five children. The knowledge was adequate on the rate of respiration in identifying pneumonia among children aged >1 year. However, knowledge was

inadequate among children aged <1 year. On the other hand, a great majority of SSs, SKs, and POs (81-96%) had adequate knowledge about the dose of co-trimoxazole (medicine) for treating pneumonia in all groups of children (Table 6).

The overall knowledge of health workers in programme areas about ARI including pneumonua was incomprehensive, however, it was worst in non-programme areas.

Table 5. Knowledge of health workers about pneumonia and causes of pneumonia by study areas (%)

	SS			SK			PO		
	ARI	No ARI	All	ARI	No ARI	All	ARI	No ARI	All
Pneumonia means									
Fast breathing	50.0	42.0	46.0	30.0	39.0	34.0	17.0	39.0	28.0
Chest in-drawing	24.0	14.0	19.0	10.0	10.0	10.0	1.0	17.0	9.0
Fever	13.0	8.0	10.0	3.0	5.0	4.0	0.0	8.0	4.0
Tract and & lungs Infection	7.0	5.0	6.0	49.0	16.0	33.0	80.0	33.0	57.0
dangerous disease	17.0	9.0	13.0	10.0	11.0	11.0	3.0	2.0	2.0
Exposure to cold	49.0	35.0	42.0	24.0	21.0	23.0	6.0	24.0	15.0
Causes of pneumonia									
Cold weather	84.0	77.0	80.0	75.0	76.0	75.0	63.0	68.0	65.0
Babies are not given colostrums	8.0	0.0	4.0	20.0	5.0	13.0	33.0	3.0	19.0
Bath after delivery	13.0	1.0	7.0	13.0	1.0	7.0	29.0	4.0	17.0
Damp environment	13.0	3.0	8.0	17.0	3.0	11.0	15.0	10.0	13.0
Delivery weight <2.5 Kg	9.0	0.0	5.0	17.0	20.0	10.0	21.0	6.0	14.0
Cough and cold	12.0	6.0	9.0	9.0	2.0	6.0	7.0	2.0	4.0
Sweating	7.0	8.0	7.0	8.0	7.0	8.0	4.0	7.0	6.0
Unhygienic environment	18.0	7.0	12.0	14.0	17.0	15.0	8.0	6.0	7.0
Do not know	0.0	18.0	9.0	0.0	17.0	8.0	0.0	19.0	9.0
N	119	119	238	115	102	217	116	107	223

Table 6. Knowledge about prevention of ARI and factors increase incidence of ARI by study areas (%)

	SS			SK			PO		
	ARI	No ARI	All	ARI	No ARI	All	ARI	No ARI	All
Knowledge about prevention of ARI									
Breast-feeding upto two years	46.0	13.0	30.0	68.0	27.0	48.0	61.0	31.0	51.0
Weaning food after six months	19.0	8.0	13.0	37.0	15.0	26.0	45.0	15.0	31.0
Adequate nutritious food	19.0	17.0	18.0	34.0	23.0	29.0	41.0	30.0	36.0
Bath prohibited after delivery	50.0	29.0	39.0	53.0	28.0	42.0	58.0	21.0	40.0
Protection from cold weather	82.0	56.0	69.0	76.0	63.0	70.0	67.0	48.0	58.0
Immunization	10.0	7.0	8.0	27.0	5.0	17.0	40.0	8.0	25.0
Vitamin A cap. supplementation	3.0	1.0	2.0	15.0	5.0	10.0	26.0	6.0	16.0
Adequate personal hygiene	64.0	55.0	59.0	71.0	57.0	65.0	68.0	64.0	66.0
Do not know	8.0	21.0	15.0	1.0	19.0	9.0	0.0	22.0	10.0
Factors increase the incidence of ARI in children under five									
Cold weather	83.0	62.0	72.0	87.0	61.0	75.0	86.0	69.0	78.0
Under-weight at birth (<2.5 kg)	35.0	8.0	21.0	56.0	20.0	39.0	70.0	26.0	49.0
Bath after delivery	64.0	27.0	45.0	65.0	25.0	46.0	69.0	29.0	50.0
Not fed colostrums	45.0	18.0	31.0	56.0	30.0	44.0	68.0	22.0	46.0
Early introducing complimentary diet	14.0	8.0	11.0	27.0	12.0	20.0	41.0	9.0	26.0
Under-nutrition	11.0	20.0	16.0	24.0	28.0	26.0	39.0	29.0	34.0
Not given vaccines	17.0	10.0	13.0	21.0	16.0	18.0	38.0	7.0	23.0
Do not know	19.0	46.0	32.0	1.0	19.0	10.0	0.0	26.0	12.0
N	119	119	238	115	102	217	116	107	223

Table 7. Knowledge about the conditions when children required transferring to hospital by study areas (%)

	SS			SK			PO		
	ARI	No ARI	All	ARI	No ARI	All	ARI	No ARI	All
Fast breathing (≥ 60 /min)	52.0	45.0	48.0	63.0	51.0	57.0	61.0	48.0	54.0
Chest in-drawing	77.0	47.0	62.0	90.0	58.0	75.0	96.0	40.0	69.0
Noisy breathing	52.0	41.0	46.0	77.0	39.0	59.0	69.0	44.0	57.0
Unconscious	30.0	5.0	17.0	40.0	14.0	28.0	53.0	17.0	36.0
Unable to drink	43.0	16.0	29.0	44.0	31.0	38.0	44.0	21.0	33.0
High fever	14.0	13.0	13.0	22.0	11.0	17.0	29.0	16.0	23.0
Severe illness	37.0	21.0	29.0	30.0	20.0	25.0	33.0	27.0	30.0
Convulsion	18.0	7.0	12.0	24.0	1.0	13.0	31.0	4.0	18.0
Excessive vomiting	8.0	3.0	6.0	15.0	3.0	9.0	17.0	2.0	10.0
Know nothing	1.0	18.0	10.0	1.0	21.0	10.0	0.0	22.0	10.0
N	119	119	238	115	102	217	116	107	223

Table 8. Knowledge about the dose of co-trimoxazole and rate of respiration in pneumonia by study areas (%)

	SS			SK			PO		
	ARI	No ARI	All	ARI	No ARI	All	ARI	No ARI	All
1 tea spoon twice daily for 2-12 months									
Agreed	83.0	17.0	50.0	90.0	14.0	54.0	96.0	22.0	61.0
Disagreed	15.0	7.0	11.0	10.0	15.0	12.0	4.0	11.0	8.0
Do not know	2.0	77.0	39.0	0.0	72.0	34.0	0.0	66.0	32.0
1 tea spoon trice daily for 13-59 months									
Agreed	18.0	11.0	14.0	11.0	17.0	14.0	11.0	22.0	17.0
Disagreed	81.0	13.0	46.0	89.0	12.0	53.0	90.0	11.0	52.0
Do not know	2.0	77.0	39.0	0.0	71.0	33.0	0.0	66.0	32.0
50 and above respiration rate/ min for 2-12 months									
Agreed	84.0	20.0	52.0	85.0	37.0	63.0	91.0	45.0	69.0
Disagreed	15.0	18.0	17.0	15.0	7.0	11.0	9.0	8.0	9.0
Do not know	1.0	62.0	31.0	0.0	56.0	27.0	0.0	47.0	22.0
60 and above respiration rate /min for 13-59months									
Agreed	40.0	19.0	29.0	31.0	28.0	30.0	15.0	26.0	21.0
Disagreed	61.0	19.0	40.0	69.0	18.0	45.0	85.0	27.0	57.0
Know nothing	0.0	62.0	31.0	0.0	55.0	26.0	0.0	47.0	22.0
N	119	119	238	115	102	217	116	107	223

The management of ARI by health workers

The management of ARI by health workers in ARI programme areas was explored in three ways: i) by asking some questions on practice, ii) by observing practice while giving treatment, and iii) by reviewing programme documents on practice.

The SSs in programme areas reported that many of them never asked mothers about duration of sign and symptoms such as cough and fever, about the presence of danger signs of ARI such as child's inability to drink, and presence of convulsion before starting treatment, even the age of children for adjusting the dose of co-trimoxazole (Table 9). They only asked about the presence of fever and cough, and breast-feeding history of their children. During giving advice to mothers on prevention of pneumonia further, the majority of SSs (85%) in programme areas only advised mothers on keeping their children in warm environment to prevent ARI further (Table 9). However, they did not frequently advice to clean nasal passages, and to breast-feed regularly. Even though they did not advise frequently to go to hospital whenever they required.

To observe the practice of ARI, the SSs in programme areas were invited to treat the sick children who were suffering from ARI symptoms (Table 10). The children with ARI symptoms were identified during the household screening by our skilled interviewers. The overall management procedure of SSs was observed. The SSs often did not ask the age of children, presence of vital sign of pneumonia (fast breathing), and others. They commonly asked about the presence of fever (76%) and cough (64%). During physical examination of children, we explored that the SSs

mostly measured fever by hand or thermometer (71-73%), and majority of them (76-85%) observed the presence of chest in-drawing especially in children with pneumonia. However, the majority did not count the rate of respiration in classifying pneumonia (either danger or not), and they did not take the initiative to hear the presence of noisy sound of breathing (life threatening sign).

Table 9. The information asked and advised by health workers during ARI treatment/management by study areas (%)

	SS			SK			PO		
	ARI	No ARI	All	ARI	No ARI	All	ARI	No ARI	All
Health workers usually asked mothers while taking history of sick children									
Age	35.0	16.0	26.0	43.0	21.0	32.0	52.0	17.0	35.0
Breast-feeding	55.0	28.0	41.0	67.0	41.0	55.0	75.0	24.0	50.0
Fever	68.0	46.0	57.0	59.0	51.0	55.0	62.0	50.0	56.0
Cough	56.0	33.0	45.0	62.0	34.0	49.0	65.0	44.0	55.0
Cough duration	23.0	9.0	16.0	25.0	12.0	19.0	25.0	21.0	23.0
Ability to drink	29.0	8.0	18.0	32.0	10.0	22.0	54.0	18.0	37.0
Convulsion	4.0	2.0	3.0	5.0	2.0	4.0	11.0	5.0	8.0
Health workers usually advised mothers about prevention of ARI further									
Keeping child in warm environment	85.0	73.0	79.0	89.0	67.0	78.0	86.0	75.0	80.0
Cleaning nasal passages	54.0	15.0	35.0	60.0	19.0	41.0	70.0	19.0	46.0
Breast-feeding frequently	46.0	16.0	31.0	68.0	42.0	56.0	56.0	33.0	45.0
Taking plenty of drinks (>6month)	17.0	5.0	11.0	24.0	6.0	16.0	50.0	17.0	34.0
Going to hospital if required	43.0	15.0	29.0	51.0	28.0	41.0	51.0	26.0	39.0
Taking adequate food up to 14 days	3.0	1.0	2.0	7.0	1.0	4.0	4.0	0.0	4.0
N	119	119	238	115	102	217	116	107	223

While administering medicine, one-third of the children with pneumonia were not given co-trimoxazole (Table 10), however, the proportion was quite (67%) high in severe pneumonia. Those who got medicines, some of them were not told about the doses. Even many of them were not told about the danger signs of ARI, and not told about the prevention of ARI further in programme areas (Table 10). When the programme records were reviewed, we found that majority of SS (65-84%) gave medicines (co-trimoxazole) to the children with pneumonia and severe pneumonia in programme areas (Table 11).

We also explored the nature of treatment of ARI given by the SSs in non-programme areas by asking questions. Majority of the SSs referred children with pneumonia or severe pneumonia to hospitals (44%) and to doctors (30%) (Table 12). In case of

common cold, majority of SS (47%) treated children with anti-histamine syrup/histamine.

Table 10. Observation of SSs' ARI management in programme areas (%)

	Types of ARI			
	Cough and cold	Pneumonia	Severe pneumonia	All
Illness history				
SSs asked the age	51.0	59.0	31.0	53.0
SSs asked about fever	78.0	70.0	82.0	76.0
SSs asked about cough	64.0	61.0	76.0	64.0
SSs asked about the duration of cough	29.0	22.0	30.0	26.0
SSs asked about fast breathing	36.0	57.0	52.0	44.0
SSs asked about breast-feeding	43.0	47.0	39.0	44.0
SSs asked about the ability to drink	17.0	17.0	9.0	13.0
SSs asked about the convulsion	2.0	5.0	18.0	4.0
Diagnosis				
SSs measured fever by hands	71.0	67.0	73.0	70.0
SSs counted rate of respiration	25.0	32.0	39.0	28.0
SSs observed chest in-drawing	39.0	76.0	85.0	54.0
SSs took initiative to hear about noisy breathing	18.0	24.0	39.0	21.0
Treatment				
SSs advised mothers	72.0	40.0	70.0	62.0
SSs prescribed paracetamol syrup	23.0	15.0	12.0	20.0
SSs prescribed co-trimoxazole syrup	4.0	66.0	33.0	26.0
SSs prescribed histamine syrup <2 years	8.0	5.0	0.0	6.0
Advice				
SSs told the doses of medicine	34.0	55.0	24.0	40.0
SSs told about danger signs of ARI	12.0	22.0	36.0	17.0
SSs told to drink plenty	19.0	13.0	12.0	16.0
SSs told to prevent ARI further	14.0	16.0	15.0	15.0
n	339	184	33	556

Table 11. Treatment given in ARI by SSs in last three months in programme areas (%)

	Types of ARI			
	Cough and cold	Pneumonia	Severe pneumonia	All
Treatment of ARI from programme records				
Advice	78.0	12.0	35.0	57.0
Histamine syrup	8.0	1.0		6.0
Co-trimoxazole	3.0	84.0	65.0	29.0
Paracetamol syrup	11.0	3.0		8.0
n	495	219	20	734

Table 12. Treatment given in ARI by SSs in last months in non-ARI programme areas (%) (N=105)

	%
Treatment of cough and cold reported by SSs	
Only advice	49.0
Histacine syrup	47.0
Paracetamol syrup	12.0
Refer to doctor	3.0
Others	7.0
Treatment of pneumonia reported by SSs	
Refer to hospital	44.0
Refer to doctor	30.0
Advice	11.0
Histacine syrup	1.0
Co-trimoxazole syrup	4.0
Paracetamol syrup	3.0
No treatment provided	14.0

Availability of medicine and watch with SSs

A great majority of SSs (44%) did not have co-trimoxazole syrup to treat pneumonia instantly in programme areas (Table 13). Among those who had medicine, one SS had 3 bottles on average. Furthermore, SSs sold medicine at different prices in programme areas. The difference between the lowest to the highest was Tk. 14 for paracetamol syrup and Tk. 10 for Co-trimoxazole syrup. In addition, many of them did not have watch to count respiration rate to detect and to classify pneumonia.

Table 13. Availability of medicine with SSs in ARI control programme areas (N=119)

Availability of co-trimoxazole syrup with SSs (%)	56.0
Average number of co-trimoxazole bottles with each SS	2.65
Average price of co-trimoxazole syrup (Taka)	22.30
Price variation (Taka)	10.0
Availability of paracetamol syrup with SSs (%)	36.0
Average number of paracetamol bottles with each SS	2.3
Average price of paracetamol syrup (Taka)	16.0
Price variation (Taka)	14.0
Availability of watch to count respiration rate (%)	24.0

Barriers in implementing ARI programme

Two-third of the SSs reported that they did not have difficulties in implementing the BRAC ARI control programme (Table 14). Some SSs reported that community people had mistrust on their management of ARI. An uneducated SS reported, "We tried to increase the level of awareness of mothers about ARI control programme. However, they did not want to hear it. People said that I did not have education, how

could I treat disease.” One SS reported, “Village mothers often say that I am not a doctor, my family does not have a doctor, and how can I treat children.” One young SS reported, “One lady in my village said that she had money, she was able to go to a doctor. She said that I came from poor family, so poor would come to me for treatment.”

Table 14. The barriers that SSs faced in ARI control programme (%) (N=115)

Lists of barriers	%
During implementation of programme	
No barriers	61.0
Lack of trust on ARI management by SSs	28.0
Want to get free medicine from BRAC	11.0
Others	5.0
During training	
No barriers	92.0
Insufficient training materials	8.0
During supervision	
Get help always from SKs	98.0
Do not get help from SKs	2.0

Profile of mothers and their households in programme and non-programme

Three-fourth of the mothers' age was <30 years, and they had single child aged under five (Table 15). One-third of the mothers had never been to school. The mothers were mostly engaged in domestic chores (97%). Most of the households had mud floor, and some had no window for passing air (Table 16). Tubewell was the main source of drinking water in households (98%). However, wood (79%) and straw (66%) were the main fuel sources for cooking, and kerosene lamp (59%) and electricity (42%) were light sources in the households. Two-third of the households had smokers (66%). On average, 3.5 people slept with children in same room. A great majority of the households' monthly income was below Tk. 5,000 (66-73%), and half of the mothers self-rated their households as deficit in last one year (Annex 1).

Table 15. Profile of mothers by study areas (%)

		Study areas		
		ARI programme	No ARI programme	All
Age in years	<30	74.5	77.5	76.0
	+30	25.5	22.5	24.0
	Mean (±SD)	26.02 (±5.4)	25.6 (±4.5)	25.8 (±5.1)
Years of school	No	33.0	28.0	31.0
	1-5 years	36.0	36.0	36.0
	6-10	29.0	34.0	31.0
	+10	2.0	2.0	2.0
	Mean (±SD)	3.9 (±3.5)	4.5(±3.5)	4.2(±3.5)
Occupation	Housewife	97.0	98.0	97.0
	Other	3.0	2.0	3.0
Children <5-year	Single	74.0	78.0	76.0
	Two	24.0	20.0	22.0
	Two+	2.0	2.0	2.0
Religious	Muslim	93.0	91.0	92.0
	Others	7.0	9.0	8.0
N		1442	1438	2880

Table 16. Profile of the households by study areas (%)

	Study areas		All
	ARI programme	No ARI programme	
Types of floor			
Mud	93.0	92.0	92.0
Pucca	7.0	8.0	8.0
Windows			
Present	71.0	78.0	75.0
Absent	29.0	22.0	25.0
Source of drinking water			
Tubewell	97.0	98.0	98.0
Tap	3.0	2.0	2.0
Toilet shared	90.0	91.0	90.0
Fuel used			
Wood	83.0	76.0	79.0
Cow dung	22.0	28.0	25.0
Straw/shrub/grass	60.0	71.0	66.0
Lighting			
Kerosene lamp	66.0	51.0	59.0
Electricity	34.0	51.0	42.0
Separated kitchen	92.0	92.0	92.0
Family history of smoking	68.0	67.0	66.0
Average number of people slept in a room (mean $\pm$ SD)	3.61($\pm$ 0.90)	3.48($\pm$ 0.72)	3.54($\pm$ 0.82)
N	1442	1438	2880

Maternal knowledge by ARI intervention

Awareness and knowledge of mothers about ARI was compared between programme and non-programme areas. We found that almost all mothers heard the name of pneumonia (Table 17). They were also aware of pneumonia in under-five children. When the mothers were asked about clinical symptoms and signs, cough and cold was mostly cited (69-78%, $p < 0.001$). However, danger signs such as fast breathing (52%), chest in-drawing (27%), and noisy breathing (31%) were not cited frequently. Unable to drink (8%) and convulsion (1%) were rarely known to mothers in both areas. However, the knowledge of prevention seemed to be low compared to the knowledge of symptoms and signs. Two-third of the mothers reported that personal hygiene could prevent ARI (more in ARI areas 74% vs 65%, $p < 0.05$). However, one-third told about clean environment. But child immunization, adequate diet, breast-feeding during infancy, and vitamin A supplementation were known to a very small proportion of mothers.

In the study, the overall knowledge of mothers on symptoms and prevention of ARI were estimated. The knowledge scores of symptoms were estimated if mothers could correctly mention at least four out of all seven items (symptoms and signs) without prompting. However, the knowledge scores of prevention were estimated on the basis of at least two accurate answers out of six items. We found that knowledge scores of symptoms (10 vs 7%, < 0.05) and prevention (48% vs 32%, < 0.05) was

higher in programme areas than non-programme areas, but the level of awareness in both areas was not of expected level.

Table 17. Awareness of mothers about ARI by study areas (%)

	Study areas		All	Significance
	ARI programme	No ARI programme		
Mothers heard about pneumonia	99.0	100.0	99.0	p>0.05
Know about causes of ARI				
Exposure to cold weather	95.0	93.0	94.0	p<0.05
Cough	12.0	8.0	10.0	p<0.05
Unclean body	8.0	4.0	6.0	p<0.001
Fever	6.0	5.0	6.0	p>0.05
Know about symptoms and signs of ARI				
Fever	39.0	25.0	32.0	p<0.05
Cough and cough	78.0	69.0	74.0	p<0.001
Rapid respiration	54.0	51.0	52.0	p>0.05
Noisy breathing	28.0	33.0	31.0	p<0.05
Chest in-drawing	27.0	26.0	27.0	p>0.05
Not able to drink	8.0	8.0	8.0	p>0.05
Convulsion	2.0	1.0	1.0	p>0.05
Clinical symptom and sign (4+ items) ^a	10.0	7.0	9.0	p<0.05
Know about common age for pneumonia				
≤5-year	96.0	94.0	95.0	p>0.05
+6-year	4.0	6.0	5.0	
Know about prevention of ARI				
Breast-feeding	17.0	6.0	12.0	p<0.001
Personal hygiene	74.0	65.0	70.0	p<0.001
Clean environment	35.0	31.0	33.0	p<0.05
Proper diet	11.0	9.0	10.0	p>0.05
Vitamin A supplement	1.0	1.0	1.0	p>0.05
Immunization	10.0	5.0	7.0	p<0.001
Do not know	10.0	18.0	14.0	p<0.001
Prevention (2+ items) ^b	48.0	32.0	40.0	p<0.001
N	1442	1432	2880	

^a A mother was considered to have adequate knowledge of clinical symptoms and sign if she could correctly mention at least four out of seven items without prompting.

^b Accurate answers of at least two out of six items in preventive measures were considered adequate

The study also explored the association between knowledge and socioeconomic variables (Annex 2). The knowledge score of symptoms, and prevention increased with education and income (p<0.05). The knowledge was differed by religion and the maternal, neonatal and child health programme (MNCH). The mothers from MNCH programme areas appeared more knowledgeable.

The mothers were also asked about the cause of ARI, available healthcare providers to treat ARI in local areas, and source of information. A great majority of the mothers told about cold weather as the cause (94%) (Table 17). More than half of the mothers

in both areas reported that the village doctors were available providers in their living place for treating ARI (Table 18). Many mothers in programme areas did not mention the name of BRAC ARI control programme or SS. However, some mentioned about government hospital, MBBS doctors, etc. as available providers. Most of the mothers of sick children would go to village doctors rather than BRAC for seeking treatment (Table 18). A great majority of the mothers (88-95%) in both areas perceived that allopathic medicine was appropriate for ARI treatment (Table 18). The common sources of information of mothers about ARI in village areas were neighbour (35%) followed by self-experience (30%). However, SS was also mentioned in addition in programme areas (36%) (Table 18).

Table 18. Awareness of mothers about local healthcare providers, ARI treatment, and their sources of information by study areas (%)

	Study areas		All	Significance
	ARI programme	No ARI programme		
Know about available providers for ARI treatment				
MBBS doctor	18.0	16.0	17.0	p>0.05
Village doctor	55.0	70.0	62.0	p<0.001
Drug-seller	27.0	43.0	35.0	p<0.001
BRAC	55.0	1.0	28.0	p<0.001
Health centre	6.0	7.0	7.0	p>0.05
Hospital	25.0	33.0	29.0	p<0.001
Do not know	3.0	7.0	5.0	p<0.001
Know about appropriate treatment of ARI				
Allopathic	95.0	88.0	92.0	p<0.001
Homeopathy	4.0	4.0	4.0	p>0.05
Do not know	3.0	8.0	5.0	p<0.001
Mothers would go to providers for ARI treatment				
MBBS doctor	18.0	13.0	15.0	p<0.001
Village doctor	43.0	62.0	52.0	p<0.001
Drug seller	15.0	28.0	21.0	p<0.001
BRAC	40.0	1.0	20.0	p<0.001
Hospital	18.0	19.0	19.0	p>0.05
Information sources of mothers about ARI				
Neighbour	30.0	39.0	35.0	p<0.001
Relatives	14.0	18.0	16.0	p<0.05
Self-experience	25.0	35.0	30.0	p<0.001
SS-BRAC health worker	36.0	1.0	18.0	p<0.001
Doctor	13.0	16.0	15.0	p<0.05
Mass media	2.0	3.0	2.0	p>0.05
N	1442	1432	2880	

Awareness of mothers about ARI programme

Three-fourth of the mothers heard about the BRAC ARI control programme. Majority (76%) heard it from SSs (Table 19). However, the mothers reported that they were not aware of detail activities of the BRAC ARI control programme. A rural mother

reported, “Health worker in my village told me about the BRAC ARI control programme. When I asked her to let me know the details, she scolded me. She would inform me when my child is sick.” Besides, a young mother reported, “Health worker of BRAC does not visit often my house. I want to know the details. My child often suffers from cold and cough, but I cannot get her frequently.”

Two-third of the mothers (66%) in programme areas were happy about the health services given by the SSs at home. However, a great portion of mothers (42%) in programme areas expected to receive services from qualified doctors of BRAC. “Our health worker does not have education. She is my friend. We called her fool when she was a child. She came to my house to treat my child’s cough and cold. I never trust her treatment. Only doctor could treat ARI.” a mother reported. We also found that many mothers (54%) expected to receive free medicine from BRAC. “I do not understand why BRAC plays two roles with us. My cousin had cough for long time. BRAC detected him as a TB patient and provided him with free medicine. When my child suffered from cough and cold, she sold medicine.”, an illiterate mother reported.

Table 19. Knowledge and perception of mothers about BRAC ARI control programme (%)

Variable	%	n
Mothers heard about BRAC ARI control programme, not details	76.0	1103
Sources of information		
BRAC health worker	71.0	785
Neighbour	27.0	299
Relative	6.0	64
Perception of mothers about BRAC ARI programme		
Mothers were happy as BRAC provided services at door	66.0	946
BRAC provided information about ARI in simple way	29.0	411
Treatment cost of ARI provided by BRAC	7.0	105
Know about disease easily	3.0	40
Expectation of mothers from BRAC ARI control programme		
Mother expected free medicine from programme	54.0	780
Mothers expected MBBS doctors in programme	19.0	267
Mothers expected free treatment	11.0	154
Mothers expected regular visit of health workers	7.0	96
Mothers expected skilled health worker in programme	5.0	72
Mothers expected low price medicine	5.0	72
Mothers expected appropriate advice from programme	4.0	54
How to improve the BRAC ARI control programme		
By involving MBBS doctors in programme	42.0	607
By providing free medicine	14.0	196
By involving skilled health workers	6.0	87
By assisting patients during emergency	27.0	386
By providing medicine at low price	3.0	42

During critical health condition of children, one third of mother expected to get quick assistance from BRAC. “My child was suffering from fast breathing. SS told me to go to hospital immediately. I could not arrange money and transport to go to a hospital. I

waited for three days. BRAC could have helped us in such situation”, a poor mother said. However, some mothers (6%) suggested involving skilled health workers in the BRAC ARI control programme for better health services.

Health-seeking behaviour

Profile of sick children

The proportion of boy was higher than girl in the study (60% vs 40%) (Table 20). On average, the age of children was 21 months. Over 90% of them were immunized according to age, in addition, 82% received vitamin A capsule in the last six months. A great proportion of children were born at home (83-89%).

Table 20. Profile of sick children by study areas (%)

	Study areas		
	ARI programme	No ARI programme	All
Sex			
Boy	61.0	59.0	60.0
Girl	39.0	41.0	40.0
Age in months (mean $\pm$ SD)	20.9($\pm$ 13.8)	20.8 ($\pm$ 13.7)	20.8 ($\pm$ 13.8)
Vaccine coverage	91.0	94.0	93.0
Received vitamin A capsule in six months	83.0	80.0	82.0
Birth place			
Home	89.0	83.0	86.0
Institution	11.0	17.0	14.0
N	722	719	1441

ARI symptoms and treatment-seeking places

We found that most of the children had cough and cold in last 15 days in both programme and non-programme areas (92%) (Table 21). In addition, less than one-third had fast breathing (30%), noisy breathing (27%), and chest in-drawing (11%).

A large proportion of mothers did not seek healthcare for children with ARI symptoms in both areas (44%) (Table 21). The main reasons were financial problem (31%), disease was not considered as severe (40%), and the mothers waited for natural recovery (28%) (Annex 3). Of them who sought care, the majority went to village doctors, drug sellers, etc. rather than BRAC. We found that a substantial proportion also received traditional/spiritual treatment in both areas (25.8%). The traditional/spiritual treatment included oil-rub on chest (48%), and enchanted water (39%) (Annex 4). Majority of mothers (75%) perceived that oil-rub relieved the disease quickly (Annex 5). One poor mother reported, “When I apply oil-rub to my child’s chest, it cures cough and cold immediately.” “Oil rub is a very good technique to cure cough and fast breathing. My grandmother applied that to my father, I heard it. Even, when I was a child, my mother applied it on me. I usually apply to my son and he gets cured quickly,” one young mother reported. The mothers reported that senior members of the households like mother-in-laws, father-in-laws, etc. forced them to

receive traditional treatment. An illiterate mother reported, “My husband and I wanted to go to a doctor for seeking treatment. My father-in-law asked to go to an Imam (religious person). We did it accordingly. According to Imam, my son was attacked by evil spirit. He said that doctor could not cure the disease with medicine.”

Table 21. Children with ARI symptoms and health-seeking behaviour by study areas (%)

	Study areas		All	Significance
	ARI programme	No ARI programme		
Children with ARI symptoms reported by mothers				
Fever	52.0	40.0	46.0	p<0.001
Cough and cold	90.0	95.0	92.0	p<0.05
Fast breathing	36.0	24.0	30.0	p<0.001
Noisy breathing	27.0	28.0	27.0	p>0.05
Chest in-drawing	14.0	8.0	11.0	p<0.05
Not able to drink	4.0	3.0	3.0	p>0.05
Children received no treatment	40.0	48.0	44.0	p<0.001
Children received allopathic treatment	60.0	52.0	56.0	p<0.001
Children received spiritual treatment	26.2	25.6	25.8	p>0.05
Average treatment cost in Taka				
Mean	239.5	131.4	185.6	p<0.05
N	722	719	1441	
Treatment providers				
MBBS doctor	13.0	11.0	12.0	p<0.001
Village doctor	28.0	54.0	40.0	
BRAC <i>Shebika</i> (SS)	38.0	1.0	21.0	
Drug seller	7.0	15.0	11.0	
Homeo doctor	7.0	10.0	8.0	
Hospital	7.0	4.0	5.0	
Others	3.0	1.0	2.0	
n	438	371	809	

ARI treatment and service satisfaction

A great majority of mothers (61-74%) reported that the providers measured fever of children, but only one-third mothers reported that providers counted the respiration rate in both areas (Table 22). The mothers who went to healthcare providers were asked to show prescription or medicines while interviewing. In the observation, we found that co-trimoxazole was frequently given by providers (including SS) in the treatment of pneumonia while checking medicines at mothers' home (Table 22). The proportion was higher in programme areas (67% vs 36%, p<0.001). However, co-trimoxazole was not commonly given in severe pneumonia (Annex 6-7), in lieu of, we found that different antibiotics (32-46%) and injections (32-88%) were given by providers in both areas. However, co-trimoxazole, and anti-histamine/histamine syrup were also given in cough and cold in programme areas to a lesser extent (17%). We also explored overall cost of ARI treatment in both areas. The average treatment cost

was higher in ARI programme areas (Tk.240) compared to non-programme areas (Tk.131) (Table 21).

One in every ten children with ARI symptoms in programme areas and one in every twenty five children in non-programme areas were asked by providers to receive hospital treatment (Table 23). Some mothers did not seek treatment from hospital in programme areas. Those who went to hospital, majority of children did not require hospital treatment in programme areas. Who stayed at hospital, the average duration of staying was longer in non-programme areas (5-day) compared to ARI programme areas (3-day).

Over 90% of mothers reported that they were aware about the dose and advice (Table 22). One-third of the providers visited children at home for providing further assistance or help in programme areas. A great majority of the mother (82%) was satisfied with service of providers, however, it was more in programme areas.

Barriers in accessing ARI treatment services

The majority of mothers did not have problems in accessing ARI treatment services. However, some mothers reported about financial difficulties (9%), unavailability of skilled doctors in locally (9%), and transportation problem (6%) acted as barriers in accessing treatment services (Table 24). Regarding financial difficulty, a poor mother reported, “My husband has no work for the last two days we are almost on starvation. My child is also suffering from cough and fast breathing. I need to go to a doctor, but I do not have money to pay the doctor fees and to buy medicines.” A young mother reported about unavailability of doctors in such a way, “I live in far from the government hospital. My child is being sick. There is no doctor, no hospital, and no other health facilities in my locality. If I go to traditional healers, they are not able to treat the disease. Last year, my child had the same problem. I went to a traditional healer. He could not treat my child’s illness.” “I need to go to an *upazila* hospital for treatment of my child. But, it is far from my home. I went to a village doctor, he treated well,” an illiterate mother reported.

Table 22. Treatment of ARI given by healthcare providers by study areas (%)

	Study areas		All	Significance
	ARI programme	No ARI programme		
Medicines were prescribed by providers reported by mothers				
Syrup paracetamol	41.0	51.0	45.0	p<0.001
Syrup antihistamin/histacine	28.0	31.0	30.0	p>0.05
Co-trimoxazole	39.0	16.0	29.0	p<0.001
Other antibiotics	15.0	28.0	21.0	p<0.001
Syrup sulbutamol	4.0	11.0	7.0	p<0.001
Injection	7.0	8.0	7.0	p>0.05
No medicine/only advice	8.0	3.0	6.0	p<0.001
Providers measured fever reported by mothers				
By thermometer	35.0	45.0	40.0	p<0.001
By hands	39.0	16.0	28.0	
By assumption	9.0	7.0	8.0	
Did not measure	12.0	20.0	16.0	
Children did not have fever	4.0	7.0	6.0	
Do not know	1.0	5.0	2.0	
Providers counted respiration rate reported by mothers				
By sand watch	8.0	1.0	5.0	p<0.001
By hand watch	23.0	15.0	19.0	
By assumption	26.0	21.0	24.0	
Did not measure	29.0	41.0	34.0	
Do not know	8.0	12.0	10.0	
Others	6.0	10.0	8.0	
Providers told the dose/advice	94.0	97.0	95.0	p<0.05
Providers told mothers of sick children to go to hospital	10.0	4.0	7.0	p<0.001
Providers including SSs visited home of sick children further	34.0	7.0	22.0	p<0.001
Mothers were satisfied with providers' services	85.0	77.0	82.0	p<0.05
n	438	371	809	

Table 23. Treatment of children with ARI symptoms at hospital by study areas (%)

	Study areas		
	ARI programme	No ARI programme	All
Proportion of children with severe pneumonia were told to attend hospital	10.0	4.0	7.0
n	438	371	809
Children went to hospital for receiving treatment	78.0	100.0	83.0
n	45	15	55
Children needed hospital treatment	54.0	80.0	62
Mean duration of staying hospital for treatment	2.89	5.1	3.5
n	35	15	50

Table 24. Lists of barriers in receiving ARI treatment by study areas (%)

	Study areas			Significance
	ARI programme	No ARI programme	All	
Barriers in accessing ARI treatment				
No barriers	76.0	77.0	77.0	p>0.05
Lack of money	10.0	8.0	9.0	p>0.05
Unavailability of skilled doctor in areas	5.0	12.0	9.0	p<0.05
Transportation difficulties to access health services	8.0	4.0	6.0	p<0.05
Lack of skilled <i>Shebika</i> in local areas	1.0	1.0	1.0	p>0.05
N	722	719	1441	

Perception about the BRAC ARI control programme

Two-third of the mothers of children was happy about BRAC ARI services (Table 25). "BRAC is providing treatment at home. So, we do not need to go outside to take treatment leaving our household activities," a mother reported. In addition, some reported that BRAC provided free advice about ARI disease and management. "My child had cough and cold. Health worker of BRAC visited my home, and provided advice to maintain personal hygiene," an illiterate mother reported.

Suggestions for improving programme

The majority of the mothers wanted skilled doctors (MBBS) in BRAC ARI control programme. "We know BRAC provides ARI treatment through health workers, but no doctor is there. I believe SS had adequate training on ARI, but she is not much qualified. So, I did not go to SSs to take treatment," an educated mother reported.

Some mothers expected receiving free medicines and emergency assistance from BRAC. "It is a surprise to me that SS sells medicine to us for treating diseases, but in case of TB treatment they do not sell medicine. I knew it from my relative. They should provide free medicine like TB treatment," a mother reported. "My child had high fever, rapid respiration and vomiting. BRAC health worker asked me to go to a hospital immediately. I went to a hospital, but they started giving treatment late. Later I did not see any doctor at the hospital. Even, I did not get a nurse in emergency condition of my child. BRAC can establish health centre in our locality, so that we could get emergency treatment," reported by a young mother.

Table 25. Perception of mothers of sick children about BRAC ARI programme (%)

Variables	%	n
Perception of mothers about BRAC ARI control programme		
BRAC provided service at home	61.0	440
BRAC provided free advice about ARI	34.0	242
Programme provided low cost treatment	7.0	49
SS did not come further for helping patients	4.0	25
Medicine was available with <i>Shebika</i> and do not need to go outside home	2.0	16
How ARI progmmae could be improved further/expectation		
Mothers expected MBBS doctors in programme	42.0	306
Mothers expected free medicine	21.0	149
Mothers expected that BRAC should have organized emergency treatment at BRAC health centre	20.0	147
Mothers expected skilled health workers in	6.0	46
Others	4.0	32

Discussion and conclusion

BRAC is implementing community-based ARI control programme since 2007 using community health workers (CHW). Currently, BRAC implements the programme in 40 districts. This study presents data comparing areas with or without intervention to have an idea about how effective the ARI control programme has been and suggest modification, if necessary. We found that both the CHWs and the mothers had superficial knowledge about different aspects of ARI. The management of ARI treatment by SSs was not of expected level in the programme areas. The mothers often went to village doctors, drug sellers, spiritual healers rather than going to BRAC for taking treatment. We found that the mothers were unaware about details of BRAC ARI control programme, and they preferred to get free medicines, and services from skilled workers of BRAC.

Though the SSs in programme areas received three-day training on ARI, followed by regular monthly refresher, majority of the SSs were not adequately aware of all clinical symptoms/signs and preventive measures of ARI. We also found that SSs of BRAC considered pneumonia primarily to be caused by the child's exposure to the cold. They did not link germs to the causation of ARI. It indicates that they lacked knowledge on medical aspects of ARI. On the other hand, we could conclude that SSs would not be a good source of information to transmit knowledge to community mothers to seek early treatment and to prevent further morbidity. The role of SSs of BRAC are significantly important in implementing the programme, and in achieving the goals. However, substantial numbers of SSs were not aware of the cut-off rates for respiration for detecting pneumonia in children under one year, and to refer children with severe pneumonia to hospital for saving life. In this situation, the children are at risk of mortality in rural community. However, the SSs of BRAC had sufficient knowledge on when a child needed to be referred to hospital to save life in BRAC areas previously (Rashid *et al.* 2001). During that time, the pilot programme was limited in few areas, and so the supervision mechanism might have been more intensive.

In this study, the SSs were found to be reluctant in asking the age of children. This is a critical factor for determining the dose of antibiotics according to age. The BRAC ARI Programme should look into the matter immediately. Non-availability of medicines with SSs could be a barrier in managing ARI cases quickly. The SSs of BRAC and other providers were prescribing co-trimoxazole in cold and cough which is totally prohibited by World Health Organization (WHO) guideline and programme guideline. However, similar finding was observed in Senegal (Sylla *et al.* 2007). Maybe they were not much aware about the WHO or programme guidelines.

We also found that the SSs often did not count respiration rate. However, it is an important indicator to detect or classify the different types of pneumonia. The same

findings were observed in the case of well trained health workers in Senegal (Sylla *et al.* 2007). It can happen when low-level educated health workers are involved in managing ARI or low grade health workers are involved. Even after detection of pneumonia, we found that the mothers were not well informed by the SSs about danger sign, preventive measures and necessary measures to take when the children become sick.

The effect of the ARI control programme in raising knowledge and awareness of mothers of under-five children were also assessed in this research. The maternal awareness of childhood ARI was not of expected level in BRAC programme areas and non-programme areas. Similar finding was seen in Kenya (Sumiyu *et al.* 2003). Although the SSs had regular contact with women, most of the surveyed mothers were not being able to recognize early signs of ARI (except cough and cold) to seek prompt care for their children. Even the mothers from villages with ARI programme were not adequately aware of some key preventive measures such as immunization, adequate diet, vitamin A supplementation, etc. The same situation was observed earlier in the pilot ARI control programme of BRAC areas (Hadi 2003). The programme efforts in raising knowledge seemed to concentrate in identifying few symptoms and preventive measures. However, comprehensive knowledge dissemination depends on adequate knowledge of the health workers themselves, and how frequently the knowledge is transmitted from the workers to the people. The study clearly identified that health workers could not provide adequate ARI information, because they lacked comprehensive knowledge. As cultural concepts and definition of illness do not always have the same meaning as the biomedical definitions, it is likely to create misunderstanding between mothers and health workers (Kroeger 1983, Ellis 2002). Programme should try to understand the Explanatory Model (EM) of ARI in the community and shape their Information Education and Communication (IEC) campaign accordingly. So, the mothers can know about the available services for ARI treatment to seek care promptly.

Though the mothers were aware about available services from BRAC, it is disheartening to observe that majority of them wanted to seek care from informal providers. A number of factors such as inability of SSs to inform mothers well, less probability of getting free medicines from BRAC, the pre-conception that only village doctors could treat pneumonia might have been responsible for this. Substantial number of health workers have no formal education, and rural women may feel less inhibited to speak freely about their child's illness to them than to the doctors (Rashid *et al.* 2001).

We found that informal healthcare providers were commonly sought for treatment of ARI. Findings are similar to what is found in the Philipines and Ethiopia (Nichter 1994, Teka and Dagneu 1995), the main reason being poverty in The Philippines (Nichter 1994). In this study, the mothers reported pneumonia was due to exposure to cold weather. The perception is very old in Bangladesh (Stewart 1994). This would make the mother less likely to accept the diagnosis of pneumonia from formal healthcare providers or SSs. Sometimes signs of pneumonia are believed to be due to attack by evil spirit (Stewart 1994, Rashid *et al.* 2001). In these cases, spiritual healers were

sought and allopathic treatment was avoided or delayed. Even, mothers do not want to go to formal places, unless the child's condition deteriorates dangerously (Grace 2008, Rashid *et al.* 2001, Denno *et al.* 1994) or it depends on their perception of severity. When mothers know about causal agent, they will seek timely healthcare from appropriate place, supportive home care and comply with antibiotic treatment.

In the study, home care practices in rural areas usually involved rubbing the child's chest with oil mixture to expel mucus. This was also observed in another study done in Bangladesh (Rashid *et al.* 2001). The study found that the practice was forced by family members, but this may inadvertently lead to delay in seeking medical care. Thus, a consensus of opinion in the family was often necessary if a child needed to be taken a hospital or a clinic (Stewart *et al.* 1994, Pieche 1998, Parker 1990).

Conclusion

The knowledge of BRAC SSs and the mothers was not enough to deal with ARI management. Thus, it is difficult to expect quick management of ARI to save life of children in community. Many mothers still sought treatment from unqualified providers; furthermore, the quality of management by BRAC SSs was not of expected level. So, we conclude that many children were at risk of mortality due to ARI. BRAC ARI programme should look into the matter seriously to achieve the programme goal, and to reduce child morbidity and mortality.

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Annexes

Annex 1. Economic characteristic of household by study areas (%)

		Study areas		
		ARI Programme	No ARI Programme	All
Income per month	Upto 5,000	73.0	66.0	70.0
	+5000	27.0	34.0	30.0
Median		4000.0	4,500	4,500
perceived economy in last year	Deficit	52.0	50.0	51.0
	Not deficit	48.0	50.0	49.0
N		1442	1438	2880

Annex 2. Knowledge of mothers about clinical symptoms and signs and preventive measures by study variables (%)

	Clinical sign		Preventive measures		n
	Yes	No	Yes	No	
Age of women (y)					
<30	9.4	90.6	40.4	59.6	2188
≥30	7.4	92.6	41.0	59.0	692
	p>0.05		p>0.05		
Education					
Illiterate	7.0	93.0	35.9	64.1	880
literate	10.0	90.0	42.6	57.4	2000
	p<0.05		p<0.001		
Types of floor					
Mud	8.4	91.6	40.2	59.8	2643
Pacca	15.2	84.8	44.7	55.3	237
	p<0.001		p>0.05		
Income (Tk.)					
<5,000	7.4	92.6	38.4	61.6	2003
≥5,000	12.3	87.8	45.4	54.6	877
	p<0.001		p<0.001		
Perceived economy last year					
Deficit	7.2	92.8	40.0	60.0	1444
No deficit	11.0	89.0	41.2	58.8	1436
	p<0.001		p>0.05		
Religious					
Muslim	9.2	90.8	41.0	59.0	2658
Non-muslim	5.4	94.6	36.0	64.0	222
	p>0.05		p>0.05		
MNCH areas					
Yes	10.0	90.0	48.0	52.0	865
No	8.0	92.0	37.0	63.0	2015
	p>0.05		p<0.001		

Annex 3. Reasons for not receiving ARI treatment by study areas (%)

	Study area		All	Significance
	ARI programme	No ARI programme		
Reasons				
Financial difficulties	37.0	26.0	31.0	p<0.05
Disease was not severe	39.0	41.0	40.0	p>0.05
Waited for natural recovery	23.0	32.0	28.0	p<0.05
N	286	346	632	

Annex 4. Traditional/spiritual treatment received by mothers of sick children by study areas (%)

	Study area		All	Significance
	ARI programme	No ARI programme		
Enchanted oil	39.0	40.0	39.0	p>0.05
Oil massages on chest	46.0	50.0	48.0	p>0.05
<i>Jharfook</i>	14.0	13.0	13.0	p>0.05
Enchanted water	13.0	10.0	12.0	p>0.05
<i>Tulshi</i> juice	9.0	9.0	9.0	p>0.05
N	189	184	373	

Annex 5. Reason for receiving traditional/spiritual treatment by study areas (%)

	Study areas		All	Significance
	ARI programme	No ARI programme		
Reasons for taking spiritual treatment				
For relieving quickly	70.0	80.0	75.0	p<0.05
Senior members instructed	24.0	13.0	19.0	
Less cost	6.0	7.0	7.0	
n	189	184	373	

Annex 6. Treatment of ARI given by healthcare providers in ARI programme areas (%)

	Types of ARI				All
	Cough and cold	Pneumonia	Sever pneumonia	Very severe pnumonia	
Syrup paracetamol	46.0	35.0	36.0	40.0	41.0
Syrup histacine	43.0	13.0	16.0	0.0	28.0
Co-trimoxazole	17.0	67.0	32.0	30.0	39.0
Other antibiotics	13.0	16.0	32.0	10.0	15.0
Syrup Sulbutamol	4.0	3.0	8.0	20.0	
Injection	1.0	7.0	32.0	60.0	7.0
Only advice	13.0	4.0	0.0	0.0	8.0
N	222	181	25	10	438

Annex 7. Treatment of ARI given by healthcare providers in non-programme areas (%)

	Types of ARI				
	Cough and cold	Pneumonia	Sever pneumonia	Very severe pneumonia	All
Syrup paracetamol	58.0	36.0	77.0	50.0	51.0
Syrup histacine	40.0	19.0	15.0	13.0	31.0
Co-trimoxazole	4.0	36.0	23.0	25.0	16.0
Other antibiotics	21.0	36.0	46.0	38.0	28.0
Syrup Sulbutamol	7.0	15.0	23.0	13.0	11.0
Injection	1.0	14.0	31.0	88.0	8.0
Only advice	3.0	2.0	8.0	0.0	3.0
n	215	135.0	13.0	8.0	371