Managing pneumonia by community health volunteers: the case of ARI control programme of BRAC, Bangladesh

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Abstract

The study examined the role of ARI management practices in improving the competency of community health volunteers in diagnosing and treating pneumonia among children. Data were collected by a group of research physicians who observed the performance of a sample of 120 health volunteers in Bangladesh where BRAC has been providing community-based ARI control programme in 10 sub-districts since mid 1992. About 1,166 children aged 3-60 months were diagnosed and treated at the households by both the volunteers and physicians. The sensitivity, specificity and overall agreement rates in diagnosing and treating pneumonia were significantly higher among volunteers who had basic training and were regularly supervised. BRAC approach was flexible enough in replacing dropout volunteers by a system of in-service training. Findings revealed that an extended basic training for new entrants, frequent supervision and an integrated programme approach would further improve the programme. The study concludes that the diagnosis and treatment of pneumonia by the community health volunteers were possible at the households in developing countries if intensive basic training and close supervision of the service providers could be ensured.

Summary

BRAC, a non-government organisation in Bangladesh, developed a simple and sustainable approach to reduce ARIs in children where the community health volunteers were employed as the front-line workforce. The study assessed the role of ARI management practices on the performance of community health volunteers in diagnosing and treating pneumonia in children. Data were collected by a group of research physicians who observed the performance of a sample of 120 health volunteers in 10 sub-districts in Bangladesh where BRAC has been providing community-based ARI control programme since mid 1992. About 1,166 children aged 3-60 months were diagnosed and treated at the households. The community health volunteers were poor women with few years of schooling. They received extensive 3-day basic training that included the diagnosis of sick children by examining signs and symptoms and treating pneumonia by prescribing drugs. Routine in-service training to health volunteers were provided by the para-professionals of BRAC once a month. Not all volunteers were provided basic training because of the replacement of trained health volunteers by new entrants. The health volunteers who dropped out of the programme were replaced and given one-day in-service training to cover most aspects of the basic training. Also, the supervisory contact was a good response to fill the lack of basic training. Findings revealed that the sensitivity, specificity and overall agreement rates in diagnosing and treating pneumonia were significantly higher among volunteers who had basic training and received adequate supervision. Nearly 43% volunteers never received basic training and 27% were not adequately supervised. The volunteer service could be best used when a regular and intensive supervision system was incorporated in the programme. A large proportion of health volunteers was not adequately supervised by the para-professionals and, as a result, had difficulties in seeking professional advice and improving their performance in providing health care. The strength of BRAC approach had the flexibility in replacing health volunteers and a system of continuing education for them. Moreover, the programme was implemented at the grassroots by the less educated part-time volunteers. This made the project financially more viable compared to the use of full-time paramedics. Incorporating all components of basic training in in-service training module for new volunteers, focussing supervision system more on knowledge and skills and integrating the ARI control programme with primary health care would further improve the quality of service. The study concludes that the diagnosis and treatment of pneumonia by the community health volunteers were possible at the households in developing countries if intensive basic training and close supervision of the service providers could be ensured.

Introduction

Acute respiratory infections (ARIs) are the leading causes of morbidity and mortality in infancy and childhood in most developing countries (*1-5*). Poverty, overcrowding, air pollution, malnutrition, harmful traditional practices, delayed and inappropriate case management were identified as the reasons of high ARI mortality (*6-8*). The WHO initiated ARI control programme in mid 1980s focussing on managing pneumonia cases by community health volunteers (*4,9*). But not many countries were able to launch and implement such a programme although a one-third reduction in child deaths caused by ARIs was targeted to achieve by the year 2000 (*10*).

Bangladesh is one of the countries with high ARI case fatality rate. Nearly 400 children die each day from ARIs in Bangladesh (*11*). BRAC, a non-government development organisation in Bangladesh tried to develop a simple and sustainable approach to manage ARIs in children following the WHO guidelines (*12*). BRAC has involved the community health volunteers as the front-line workforce to identify and treat acute respiratory infection (ARI) since 1992 (*12*). The main theme of the strategy was standard case management using simple signs and symptoms of pneumonia among children. The primary responsibilities of the volunteers have been to identify and treat pneumonia cases at the household level although other basic curative and preventive services were also provided by the volunteers. The government supplied drugs and provided support in hospital-based clinical case management to the ARI control programme of BRAC.

The community health volunteers were recruited from among the poor households of the locality. Most of them had only few years of schooling. After recruitment, the volunteers received extensive 3-day basic training in BRAC offices by a group of physicians and para-professionals with experience in managing and treating ARIs. The basic training included both discussion in the classroom and practice in the field in diagnosing sick children by examining signs and symptoms (*4-5*) and treating pneumonia by prescribing drugs. In addition, they were trained to disseminate relevant information to mothers of young (<5 year-old) children to identify, prevent and treat ARIs at the household level. Each volunteer was assigned about 100-120 households around her home. They visited each household monthly to identify, diagnose and treat children with ARIs. Routine in-service training to volunteers were provided by the para-professionals of BRAC once a month. The health volunteers who dropped out of the programme were replaced by recruiting new volunteers from the community. Most often, it was not possible to organise 3-day formal basic training for the new entrants. Thus, a one-day in-service training was designed to cover most aspects of the basic training in sequence to complete in a couple of months. The purpose of the study was to assess the effects of ARI management practices particularly the

training and supervision of community health volunteers on their performance in managing pneumonia among children.

Materials and methods

The study was a cross-sectional descriptive one carried out in villages where BRAC had community-based ARI control programme in 10 sub-districts in the northern and central regions of Bangladesh with a population of 2.4 million. A total of 120 community health volunteers, 12 volunteers from each of the 10 sub-districts were selected at random. Five research physicians were recruited and trained in ARI case management in a specialised child hospital. The performance of health volunteers was observed at the households by the research physicians of BRAC. In total, the research teams examined 1,166 under 5 year old children with cough and common cold.

The WHO survey manual was used to collect data after necessary modification to adapt BRAC context. All assigned households of the sample volunteers were visited by the research team. After the verbal consent of the child's caretaker had been obtained, only children aged 3 months to 5 years with cough, common cold and runny nose were considered to be included in the sample. The health volunteers diagnosed each child, provided treatment with drugs where necessary. The research physician observed and documented the clinical diagnosis of each health volunteer. The research physician then re-examined the same child and noted down the type of treatment should be given including the name of the drugs. The reports were then compared to evaluate the performance of the health volunteers. The data were collected during December 1998 through February 1999.

In assessing the ARI management practices on the performance of health volunteers, three indicators viz. agreement in diagnosis, treatment and drug use in addition to sensitivity and specificity rates were used in this research. The analysis begins with a description of the health volunteers and study children. Then, the role of basic training and supervision in diagnosing and treating pneumonia cases was assessed. Finally, the net effects of basic training and supervision on the performance of volunteers were estimated. In the absence of longitudinal data, this study has followed the cross-sectional approach. The results might have generated biased estimates of the effects of ARI management practices in improving the performance of health volunteers. To minimise the possibility of selection bias, multivariate analyses have been used to control the effects of confounding factors. The logit model was used because the dependent variables were made dichotomous (*13-14*).

Results

The characteristics of the community health volunteers and study children are shown in Table 1. A total of 1,166 children were examined by 120 community health volunteers. Of the sample health volunteers, 56.7% received three-day intensive basic training in diagnosing and treating pneumonia cases. The rests had received only a one-day in-service training onee a month along with other volunteers. Although the ARI programme launched about 80 months ago, the mean length of experience of the volunteers was only about 64 months indicating that a large proportion of the volunteers joined later in the programme. The volunteers were expected to be supervised by the para-professionals of BRAC at least once a month in addition to in-service training. Data indicate that 72.5% health volunteers were routinely and adequately supervised. The mean number of contacts between the volunteers and supervisors was 2.16 per month. The mean age of the study children was nearly 1.67 years ranging between 3 and 60 months. More than a third was under 1 year old. About 56% of the children were boys.

Table 1. Characteristics of community health volunteers and the study children

Characteristic	Number	%
Health volunteer		
Basic training		
Not received	52	43.3
Received	68	56.7
Mean experience (months)	120	(64.1)
Supervision		
Irregular	33	27.5
Adequate	87	72.5
Mean number of contacts	120	(2.16)
Children		
Age (years)		
1	397	34.1
2	317	27.2
3	225	19.3
4	136	11.7
5	89	7.6
Mean age	1164	(1.67)
Sex		
Male	653	56.0
Female	513	44.0

[a] Figures in the parentheses are mean values.

Table 2 shows that the performance in pneumonia case identification by the community health volunteers was high compared to other studies (*1,5*). Exposure to basic training appeared to significantly ($P<0.01$) improve sensitivity rate or the chance to correctly diagnose the case. The difference in specificity by the training exposure was not statistically significant. Similarly, both the sensitivity and specificity rates were positively associated with adequate and intensive supervision. The gap in specificity rate by supervision, however, was narrower compared to sensitivity rates.

Table 2. Diagnosis of pneumonia by training and supervision

Health volunteer diagnosis	**Research physician diagnosis**	
	Pneumonia	**No pneumonia**
All	67.7	95.2
Basic training		
Not received	63.2	67.2
Received	71.9	96.3
Supervision		
Irregular	49.4	88.5
Adequate	77.0	97.6
N	221	945

The overall agreement proportion between health volunteers and research physicians in diagnosing (89%) and treating (87.2%) sick children including prescribing antibiotics (89.3%) in case of pneumonia appeared to be reasonably high (Table 3). The health volunteer performance in the management of pneumonia had largely been influenced by training and supervision system of the ARI control programme. For example, correct diagnosis of pneumonia was significantly ($P<0.01$) higher among volunteers who received basic training (90.8%) than who did not (86.1%). Similarly, regular and adequate supervision by the para-professionals significantly ($P<0.01$) improved the performance of the volunteers in diagnosing pneumonia. The number of supervisory contacts had positive association with the performance of volunteers.

The length of experience as health volunteer had no association with the quality of performance. Unlike our expectation, the volunteers performed poorly with the length of experience in ARI control programme. One possible reason of such poor showing is that the earlier recruits were relatively older

and relatively less educated and, thus, were less attentive than the new entrants in diagnosing and treating pneumonia. The performance in treating and prescribing drugs (antibiotics) to the sick children had also been influenced by the training exposure and regular supervision by the para-professionals. Only 13 study children received antibiotics and, thus, the role of basic training and supervision in correctly prescribing drugs was not found statistically significant.

Table 3. Factors affecting diagnosis and treatment of pneumonia

Factors	Diag-nosis	*P*	Treat-ment	*P*	Anti-biotic	*P*
All	89.0		87.2		89.3	
Health volunteer						
Basic training		<0.01		<0.01		ns
Not received	86.1		84.0		84.6	
Received	90.8		89.2		92.8	
Supervision		<0.01		<0.01		ns
Irregular	77.7		74.6		80.6	
Adequate	93.4		91.8		92.9	
Number of supervision		ns		ns		<0.05
0 - 1	86.3		85.9		91.3	
2 - 3	89.1		87.1		91.2	
4 - 6	92.2		89.0		57.1[a]	
Experience (years)		<0.01		<0.05		ns
< 4	93.5		92.6		95.8	
4 - < 6	90.3		86.8		83.3	
6 +	86.3		85.2		90.2	
Children						
Age (years)		ns		ns		<0.05
1	87.4		85.1		88.6	
2	88.3		86.8		100.0[a]	
3	87.1		85.8		84.6	
4	94.9		92.6		62.5	
5	94.4		93.3		80.0	
Sex		ns		ns		ns
Male	88.5		85.6		84.9	
Female	89.7		88.9		95.8	

[a] Number of cases is too small.

The performance in diagnosing and treating pneumonia was better among the older than younger children. It was not clear why the female children were better diagnosed and treated than male children although the differences in performance were not statistically significant. The proportion of prescribing antibiotics to sick children did not show any consistent pattern with age.

The net effects of getting basic training and regular supervision on the three performance outcomes viz. correct diagnosis, treatment and antibiotic use were assessed by employing multivariate analysis where the role of confounding variables such as age and sex of children were controlled (Table 4). Results of logistic regression analysis performed on diagnosis of health volunteers (model 1 in Table 4) indicated that among all volunteer and child attributes, both the basic training and supervision along with the age of child significantly ($P<0.01$) predicted correct diagnosis. Health volunteers who had exposure to basic training were significantly more likely to correctly diagnose a sick child than volunteers who had no such training. On the other hand, intensive supervision by the para-professionals increased correct diagnosis more than four times ($P<0.01$) when other variables were controlled. The number of supervisory contacts also played a positive role. The length of experience had no significance in the correct diagnosis of pneumonia. The level of accuracy in diagnosis also increased with the age of child. The probability of female child to be better diagnosed than male child was not statistically significant.

Table 4. Results of logistic regression model

Variable	Standard error	P-value	Odds ratio	Confidence interval[a]
Model 1				
Outcome: correct diagnosis				
Predictors:				
Basic training (rc=no)	0.19	0.011	1.65	(1.12–2.42)
Duration of experience (months)	0.01	0.963	1.00	(0.99–1.01)
Supervision (rc=irregular)	0.20	0.001	4.30	(2.92–6.33)
Number of supervision	0.09	0.081	1.17	(0.98–1.40)
Age of child (months)	0.01	0.011	1.02	(1.00–1.03)
Sex (rc=male)	0.20	0.855	1.04	(0.70–1.53)
Model 2				
Outcome: correct treatment				
Predictors:				
Basic training (rc=no)	0.18	0.006	1.66	(1.16–2.39)
Duration of experience (months)	0.01	0.584	1.01	(0.99–1.01)
Supervision (rc=irregular)	0.19	0.001	4.20	(2.92–6.06)
Number of supervision	0.08	0.297	1.09	(0.93–1.29)
Age of child (months)	0.01	0.006	1.02	(1.01–1.03)
Sex (rc=male)	0.19	0.146	1.31	(0.91–1.90)
Model 3				
Outcome: correct antibiotic use				
Predictors:				
Basic training (rc=no)	0.72	0.061	3.88	(0.94–16.03)
Duration of experience (months)	0.02	0.253	1.02	(0.99–1.05)
Supervision (rc=irregular)	0.70	0.115	3.04	(0.76–12.09)
Number of supervision	0.41	0.035	0.41	(0.18–0.94)
Age of child (months)	0.02	0.198	0.97	(0.92–1.02)
Sex (rc=male)	0.86	0.083	4.44	(0.82–23.98)

[a] Figures in the parentheses are 95% confidence levels.

The results of the effects of basic training and regular supervision on correct treatment and correct prescription of drugs by health volunteers (models 2 and 3) were largely similar to the effects on diagnosis. The basic training exposure increased the chance of correct treatment to 66% ($P<0.01$) and correct prescription to 3.9 times. On the other hand, adequate supervision raised the treatment accuracy

to 4.2 times and correct use of antibiotics to more than 3 times when other variables were controlled. Again, the length of experience as volunteers had no significance to the accuracy of treatment or providing appropriate drugs to sick children.

Discussion

The ARI management practices, designed and implemented by BRAC, demonstrated that less educated rural women can produce desired outcome in identifying and treating pneumonia in children at the community level. A much higher sensitivity than specificity rate indicated that the health volunteers emphasised more on 'not to provide wrong treatment' than 'providing no treatment' to the children.

One major weakness of the ARI control programme has been the lack of ability to provide basic training to a significant proportion (43%) of health volunteers. This was partly due to the replacement of trained health volunteers who either performed poorly or left the ARI programme during the early months after recruitment. A routine system of organising basic training for the new volunteers was difficult because of time and resource constraints. A one-day in-service training was designed to recover some aspects of the lack of basic training for the new entrants. The supervisory contact by the para-professionals, in addition to in-service training, was a good response to fill the lack of basic training to a large extent. The volunteers made mistakes in the beginning which gradually reduced with continued in-service training and corrective supervision.

One feature of the success of ARI control programme has been the close link between the programme management and the grassroots health volunteers through in-service training and close supervision. The study shows that a regular and continuing education can not only sustain the required level of knowledge and skills of health volunteers but also has the potential to improve the competencies of volunteers (*8,15*). Transferring new knowledge and skills to health volunteers through such contacts would, therefore, be possible in the changing contexts to ensure better quality of services.

Providing good training in case management of ARIs does not necessarily ensure high quality services from the health volunteers unless the skills of the volunteers are effectively utilised (*16*). The volunteer service can be best used when a regular and intensive supervision system is incorporated in the programme. This study clearly indicated that a large proportion (27.5%) of health volunteers were not adequately supervised by the para-professionals and, as a result, had difficulties in seeking professional advice and improving the quality of care. It is essential that the para-professionals, who supervise the community health volunteers, should follow a schedule according to the identified needs (*8*) with more

frequent visits to health volunteers who never received basic training or had difficulties in case management.

The health volunteers provided other health services in the community along with ARI control in children. One single effort such as improving the performance in diagnosing and treating pneumonia will not help much to achieve the desired objective of raising health status in the community if other health programmes are ignored or less emphasised. The health volunteer performance can probably be best utilised in an integrated approach where other preventive as well as basic curative services are also provided.

This study has several limitations. First, the <2 months old children were not included in the analysis because the number of cases were too small and the health volunteers followed a quite different module in case identification and management of neonates. Secondly, the presence of research physicians might have forced the health volunteers to perform differently than their usual practice in treating children. Thirdly, the community health volunteers had no access to households who could afford to seek treatment from the physicians or paramedics in the community. As a result, a significant proportion of the sample children was not examined by the research team in this study. Finally, the role of age and education of the volunteers on their performance was not evaluated because of the unavailability of data. However, the health volunteer selection criteria of BRAC allowed only to recruit a homogeneous group of less educated, adult and married women from the poor households of the community. Thus, the effects of individual traits of volunteers on the performance might be limited.

The findings of this study, however, are important for the policy makers because the approach adopted by BRAC is replicable in other developing countries. The major strength of this approach is the flexibility in replacing health volunteers and a system of continuing education for volunteers. Also, the programme was implemented at the grassroots by the less educated part-time volunteers. This approach made the project financially more viable compared to the use of full-time paramedics. The programme, however, has scope to improve further by incorporating all components of basic training in in-service training module for new entrants; re-designing the supervision system focussing more on knowledge and skills of the health volunteers; and integrating ARI control programme with primary health care system in the community. The study concludes that the diagnosis and treatment of pneumonia by the community health volunteers were possible at the households in developing countries if intensive basic training and close supervision of the service providers could be ensured.

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