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AN EDUCATIONAL INTERVENTION FOR ALTERING WATER-SANITATION BEHAVIOURS TO REDUCE CHILDHOOD DIARRHOEA IN URBAN BANGLADESH: FORMULATION, PREPARATION AND DELIVERY OF EDUCATIONAL INTERVENTION

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Abstract—The formulation, preparation and delivery of an educational intervention previously shown to alter hygienic practices and reduce rates of childhood diarrhoea in 25 slum communities in Dhaka, Bangladesh is described in detail. Successful aspects of the program included involvement of community members in goal determination, involvement of community members and women as trainers, focusing conflict into positive actions and utilization of informal training techniques. The failures included inadequate transfer of technical aid to communities and insufficient involvement of volunteer-trainers in curriculum development. We suggest possible explanations for these successes and failures and suggest that these hypotheses should, if possible, be subjected to formal evaluation.

Key words—personal hygiene, educational intervention, training

INTRODUCTION

Diarrhoea of infectious etiology continues to impose a high burden of morbidity and mortality upon persons in the developing world [1]. Numerous approaches to reduce rates of diarrhoea through alterations in sanitation facilities and in personal hygiene have been proposed and attempted [2]. Recently we demonstrated in a prospective randomized trial of 51 slum communities in Dhaka, Bangladesh that an educational intervention was able to alter certain personal hygienic practices of the community inhabitants and resulted in a marked reduction of diarrhoeal disease [3]. We attributed the success of this program to two major factors. First, the three messages were simple and based on behaviours already widely practiced that had been shown to be empirically correlated with reduced rates of diarrhoea. We have already explained the methodology for this determination in detail [4]. Second, considerable attention was devoted to the design and implementation of the educational intervention. It is the purpose of this paper to discuss the formulation, preparation and delivery of the educational program.

MATERIALS AND METHODS

Summary of the intervention trial

Between October, 1984 and February, 1985, we obtained information about socioeconomic and demographic characteristics, behaviours related to water use and sanitation habits, and rates of diarrhoea in children aged < six years in 51 communities of 38 families each in urban Dhaka. The socioeconomic characteristics of these slum dwelling, largely uneducated poor families are summarized in Table 1. Based on these observations we developed an educational intervention intended to improve

three behaviours which appeared to influence the incidence of diarrhoea: lack of hand washing before preparing food; open defecation by children in the family compound; and, inattention to proper disposal of garbage and feces, increasing the danger to young children to put dirty objects in their mouths [4]. The same 51 communities were then randomized either to receive the intervention ($N = 25$) or to receive no intervention ($N = 26$). The intensive intervention was implemented between March 6 and May 1, 1985, and was followed by less intensive reinforcement efforts to date. During the six months after the intervention, the rate of diarrhoea (per 100 person-weeks) in children < six years was 4.3 in the intervention communities and 5.8 in the control communities (26% protective efficacy; $P < 0.0001$). A corresponding improvement of hand washing practices before preparing food was noted. Although no change in the defecatory practices of young children was noted, we cannot state whether this reflected a real phenomenon or an insensitivity of our behavioural observations. Further, although the percentage of intervention and non-intervention communities with some garbage and feces in the living areas remained equivalent, the field officers did note that the amount of such debris appeared to have decreased in the intervention communities [3].

Formulation of educational approach

Although there have been several reports on the outcomes of educational interventions in personal hygiene, the details as to how these outcomes were achieved or not achieved are rarely reported [5]. Nevertheless, in spite of this general lack of documentation of methodology in individual studies, there is an expanding literature recommending a general approach to educational interventions based on personal experience and some case studies. We used this

Table 1. Sociodemographic and behavioural characteristics of intervention families

	Intervention families (N = 937)
<i>Demographic factors</i>	
Population aged < six years	1060 (20%)
Median number of persons in family (range)	5 (1-15)
Education: maternal, median years completed (range)	0 (0-16)
paternal, median years completed (range)	0 (0-17)
Semi annual household migration: out-migration	224 (24%)
in-migration	124 (13%)
<i>Socioeconomic factors</i>	
Family wealth: median income of family per month (range)*	Tk. 1000 (50-30,000)
house constructed of thatch	537 (57%)
ownership of radio	256 (27%)
ownership of watch	283 (41%)
One room in house	276 (29%)
Sanitation facilities: tap or tubewell water	162 (17%)
sanitary and pit latrine	394 (42%)
<i>Behavioural characteristics†</i>	
Mother wash hands before preparing food (percent first episode observed)	57 (62%)
Children defecate in living area (percent first episode observed)	20 (39%)
Garbage, feces in living area (percent sentinel households)	64 (63%)
Children put garbage in mouth (percent sentinel households)	43 (42%)

*Tk. 29 = U.S.\$1.00.

†Randomly selected subset of 102 families.

literature to design the general approach and goals of our training program and established a record-keeping system to enable 'process documentation' of our efforts [6].

Our approach was based on the premise that beneficial changes can only be accomplished through involvement of community residents in goal determination [7]. Achieving such involvement can only occur after a thorough introductory phase of training and sharing of experiences of the trainees [8]. Because of women's importance in determining the hygienic conditions of a household [9], trainers should include, whenever possible, women who are actual community members [10]. The introductory phase of training should both provide basic factual information to the trainers, and develop the competence of the trainers in the following social skills. First, the trainers have to recognize formal and informal community leaders and incorporate them into the overall program. Second, the trainers have to recognize that conflicts are inevitable but that communities can be guided not only to resolve these disputes but to turn them into positive forces. Third, training should be informal and actively involve the trainees [5]. Certain specific approaches that are conducive to this involvement would include group discussions, case studies, games, role playing, drama and stories [11-13]. Fourth, frequent feedback between the trainers and project organizers and the community is imperative [5, 10]. Finally, technical and resource back-up must be available to satisfy legitimate community-based requests [9].

Development of training program

Selection of trainers. The training personnel included three categories of persons. First we recruited seven salaried and university educated women ('trainers') who, in addition to developing materials and teaching, were to be responsible for scheduling the community visits, aiding the community in efforts to procure technical support, liaising between the com-

munity and project organizers and maintaining daily records in a log book detailing the training process.

The second category of trainers included 25 semi-literate women, one of whom lived adjacent to each of the 25 communities selected to receive the intervention and were of a socio-cultural background similar to that of the community members. Each of these women belonged to the Urban Volunteer Program and, after receiving a two-week course in several primary health care topics, had returned to their communities to deliver ORS, vitamin A capsules and offer nutritional counselling [14]. Since the beginning of the present study each 'volunteer' had been encouraging her community to participate in the study and had acted as a liaison officer between the community and organizing staff. These volunteers had three roles: (1) to help develop training materials; (2) to serve as trainers; and, (3) to function as respected community members capable of transmitting community concerns and perspectives to the trainers and project organizers. The volunteers received a small monthly stipend.

Finally, leaders from each community (landlords, religious leaders, local government representatives and energetic or particularly capable individuals) were incorporated into the planning process. The number of such persons varied in each community. They were expected to conduct community meetings, carry out community decisions, aid in resolving community disputes, motivate members and, when appropriate, organize financial donations to procure supplies.

To document the process of the intervention, each of the seven trainers maintained a daily log book in which they noted both their observations and those of the volunteer trainers and community members about the interest and participation in the sessions, the efforts made by the communities and actual changes. These notations were discussed in a daily group meeting by all seven trainers. In the present study there were also observations made by trained field research officers who had not participated in the

formulation or delivery of the intervention. These observations were recorded on highly structured pre-coded data forms [4].

Training of personnel. The seven trainers received eight weeks of preparatory training at the International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) before beginning the educational intervention. The program in the first three weeks was designed to provide the trainers with necessary factual and technical information, to develop their abilities to involve communities directly in the planning process, and to develop a specific approach and specific materials to be used in the educational process. The trainers spent half of each day with the staff of a local non-traditional educational facility, the Village Educational Resource Centre (VERC). During this time the trainers were introduced to the concept of community participation and diagnosis, participated in numerous simulated discussion and problem solving sessions, and were supervised in some field activities. In the afternoons, working with the organizing staff, the trainers developed training materials. For the next three weeks the seven trainers were joined by the 25 intervention volunteers. The trainers, under the supervision of staff members from VERC, attempted to introduce the concept and practice of community involvement to the volunteers through practical exercises. Time was spent experimenting with and modifying the training materials being developed.

At the conclusion of this six weeks phase of largely classroom exercises, the trainers and volunteers participated in a two weeks phase of supervised training activities in slums outside of the project areas. Each trainer worked with the four or five volunteers with whom she would be working during the intervention. Alterations and development of materials based on these experiences was continued by the trainers and volunteers.

Educational intervention

Schedule. For eight weeks each trainer spent 5 to 6 hr a day in her four communities. Each volunteer spent 1 to 2 hr teaching in her community. The volunteers met with their respective trainers daily and the trainers met together with the organizing staff daily. The schedule of interactions with the community leaders was dictated by need and circumstance. The volunteers met as a group with the organizing staff and trainers one day per month at ICDDR,B.

At the end of the eight weeks of intensive educational intervention, one trainer continued to visit all 25 communities for discussions and organizational meetings. The volunteers and community leaders continued their involvement in their own communities. The volunteers met weekly in small groups with the trainers and every two months as a group with the trainer and organizing staff at ICDDR,B.

General training approach. To best achieve the educational goals outlined earlier we developed a three part educational process: consciousness-raising of the community to recognize hygienic problems through the training materials; self diagnosis at the personal, family and community level through discussions and educational materials; and therapeutic plans and action. Throughout the intensive inter-

vention and reinforcement periods the main messages were repeated directly and indirectly through old and new training materials.

Consciousness raising. The training materials used extensively during this period (pictorial series, photography series, flexiflans [12], games and films) are described in detail in Table 2 and samples are illustrated in Figs 1-5.

The format during the consciousness raising period included person-to-person contact by the volunteer or trainer to an individual, especially a community leader or a non-participatory or hostile individual. The volunteer and/or trainer also met with small groups of women only or children only (6-10 people). On occasion, a presentation was made to a large mixed audience.

At first the trainer assigned tasks to the volunteer (e.g. conduct a children's session with the flexiflans, praise all mothers observed to wash their hands), community leaders (e.g. discuss with a mother why she was not participating) and children (e.g. remind their mothers to wash their hands). Eventually most communities assigned their own tasks internally.

Self diagnosis. This stage evolved immediately after the intervention had begun and still continues. Initially discussions about local hygienic problems were conducted only in the presence of a trainer or volunteer and usually only as a result of a session with one of the training materials. Quickly in some communities and eventually in all, community members were able to list problem areas, divide them into personal, family and community domains, prioritize them and determine realistic work plans. These efforts frequently involved several meetings with a variety of persons. During this period the trainers in particular, but also the volunteers and community leaders, played a major role in maintaining the momentum necessary to organize the series of meetings frequently required.

Self therapy. Finally, in the self therapy phase a plan was developed and accepted by the community. If outside resources were necessary, the trainer aided the community in procuring them and in obtaining the necessary technical advice for their proper installation and usage.

RESULTS

Development of training program

Training personnel. The seven trainers had all been involved in 'social work' previously but had not had experience with community involvement techniques nor with informal training materials. Following the introductory training they had no difficulty in the organizational and documentation aspects of their work, and all were able to use the materials well. Four of the trainers became skilled in recognizing and incorporating existing community leaders and particularly talented community individuals into the program. All trainers appeared to be well regarded by the communities. Although none of the trainers had difficulty in understanding the three messages, all had difficulty comprehending that these were central issues around which the training materials, discussions and plans were to be focused; initially the trainers wished to introduce all of their hygienic



Fig. 1. Wash hands before preparing food (see Table 2, 1, 1 for legend).

knowledge rather than focus on the three targeted issues.

The performance and community acceptance of the volunteers was more variable. All 25 volunteers ap-

peared to the trainers to realistically represent the beliefs and expectations of their respective communities. However, only 14 of the volunteers were rated by the trainers as very active, and two of these active



Fig. 2. Keep living area free of stool and garbage (see Table 2, 1, 2 for legend).



Fig. 3. Community life (see Table 2, II, 1 for legend). This picture was not representative of urban life.

women were not well accepted by their communities. Of the 11 women rated as less active, two were felt to perform high quality work but had taken on other jobs since the study began and so were not readily available. Six of the original 25 volunteers had to be replaced during the 12 month period due to out-migration or marriage.

The community leaders played important roles. In several communities, wide participation began only when the landlord's wife began to encourage the activity. In five communities the leaders donated substantial sums for procurement of materials. In six communities the landlord set aside specific plots of land to be used for defecation. In 14 communities the landlord cleaned out garbage heaps and converted them into vegetable gardens or play areas for children. One landlord made his tap available to all community members. However, not all involvement was positive. Two landlords refused to participate and one actively discouraged the participation of

community members. One landlord threatened his tenants with eviction if they did not keep their compounds free from garbage and feces. Another landlord, so impressed by the improved quality of the community, attempted, unsuccessfully, to raise the rent.

Training of personnel. The basic training period appeared to be adequate for the trainers. A need for greater involvement of the volunteers, particularly in materials development, was noted by both the trainers and the volunteers. More frequent group discussions by the volunteers with the trainers during and after the intensive intervention was desired by both groups.

Educational intervention

Consciousness raising. The materials were generally well accepted by the community. The trainers felt that the mothers were most interested in work related pictures (e.g. mothers cooking or cleaning), pictorial



Fig. 4. Sick child, healthy child (see Table 2, III, a for legend).



Fig. 5. Flexiflans (see Table 2, IV for legend).

stories and in discussion groups. The children preferred working with the flexiflans, listening to stories and engaging in drama.

Some of the materials were less than adequate. One of the pictures appeared more rural than urban and so community members felt that the problems represented were not the same as their own (see Fig. 3). Many of the 'do and don't' photographs were confusing and stimulated very little discussion. Larger, coloured pictures were recommended by the community members. Photographs were preferred over drawings.

The timing of the visit to the communities was very important. In the morning women would participate in sessions for only 15 to 30 min. In the afternoon, when cooking chores were completed, they were eager to continue meetings beyond one hour. Meetings involving men had to be held in evenings or during the weekend, even in communities where men were present in the day.

The assignment of tasks was very successful, particularly amongst the children. While initially these tasks were assigned by the trainers and tended to be somewhat negative (e.g. 'remind your mother to wash her hands'), quickly the children began to assign constructive duties to themselves (e.g. 'keep the play area swept'). It is possible that this early introduction of group tasks served as a useful introduction to the

highly successful rotation of duties by the adults later on.

Self diagnosis and action. Community members very quickly identified areas of hygienic need and were impatient to move on to the planning stage. In most communities once the diagnosis and planning stages had begun, meetings and formulations and action occurred without the presence of the trainer or volunteer.

The plans and activities included actions taken at a personal, family, and community level and are listed in Table 3. Those actions dependent on community initiative only tended to be more successful even when they involved a series of meetings. For example, a children's group in one community decided that they should not defecate in the living area of the compound but, due to the absence of latrines, could not identify an appropriate site. This problem was raised at a mothers' group; the mothers identified potential sites for an outhouse and, in a subsequent meeting involving husbands and the landlord, they obtained permission and financial backing for this plan. By contrast, activities highly dependent on outside supplies and expertise were not successful. An illustration of this failure is the fact that although five communities purchased and obtained the equipment necessary for sanitary latrines, only two communities actually constructed them.

Table 2. Materials used in training programme

I. Pictorial series: series of pictures to stimulate stories with alternative outcomes.	
1.	Wash hands before preparing food (see Fig. 1). (a) Child A ill with diarrhoea; (b) mother wipes anus of child A with sari; (c) mother doesn't wash hands before preparing food; (d) mother wipes eating utensils with soiled sari; (e) child B eats food; (f) child B ill with diarrhoea. <i>Alternate cards:</i> (b1) mother wipes anus of child A with leaf; (c1) mother washes hands; (d1) mother uses cloth to wipe eating utensils; (f1) child B remains healthy.
2.	Keep living area free of stool and garbage (see Fig. 2). (a) Healthy child; (b) child eats food surrounded by garbage and feces; (c) child has diarrhoea, child malnourished. <i>Alternate cards:</i> (b1) Mother cleans up stool from living area; (b2) mother cleans up garbage from living area; (b3) child defecates in latrine away from living area; (b4) child eats in clean area; (c1) healthy child.
3.	How to keep a healthy child well. (a) Healthy child; (b) child ill with diarrhoea. <i>Alternate cards:</i> (c1) separate hole for defecation; (c2) latrine; (c3) separate cloth for wiping hands, dishes; (c4) wash basin near cooking/eating area; (c5) mother cleaning stool and garbage.
4.	Community choice. (a) Neat clean community; (b) filthy community. <i>Sample questions:</i> Which community do you wish to live in? How would you make the second one look like the first? Which community is like yours?
II. Poster picture: single drawings to stimulate discussion.	
1.	Community life (see Fig. 3). <i>Sample question:</i> What activities might not be healthy? What changes could be made? What aspects of this picture are like your community?
2.	Hands being washed. Similar questions.
3.	Simple hole for defecation. Similar questions.
III. Photography series.	
1.	Two sets of same child, one when she is malnourished and one when she is adequately nourished (see Fig. 4). <i>Sample questions:</i> Which child is sick? Healthy? How did this healthy child become sick? or. How did this sick child become healthy? Which child does your child look like? How can you prevent your child from looking like this?
2.	Multiple community photos with 'do's' and 'don't's'. Similar set of questions.
IV. Flexiflans (see Fig. 5).	
Flannel board and women, men, children, children defecating, latrines, houses, trees, garbage bins, dust pans, brooms, pots, pans, dishes, fires, garbage, stool and feces, food, cows, dogs, pigs, chicken, fencing. <i>Sample questions:</i> Make a picture of how your community is. Do all of you agree? Is this how it should be? What things are promoting disease? or, What simple things could we change? or, Make a picture showing how you want your community to be. What things do you not have that you need to make it better? Can you substitute something you do have?	
V. Games.	
Adapted local games to main messages.	
VI. Films.	
Commercially available films in local language or in English (trainer explains).	

Cost. The development of the training materials cost less than \$500, the salaries for the seven trainers for five months totalled \$3885 and the cost of the one permanent trainer and 25 volunteers on stipends for 18 months totalled approx. \$4000. The annual cost for the research method utilized to identify the three targeted behaviours [4] and to evaluate the impact of the intervention on actual diarrhoea rates [3] was approx. \$70,000 (\$35,000 for the 21 field and central

staff personnel, \$15,000 for travel costs and \$20,000 for office, data and computer costs).

DISCUSSION

Several of the aims of our educational program were achieved. The community residents were involved in goal determination. The trainers included community members who were women. The training of the trainers not only provided them with the necessary factual basis for educating the community, but also permitted them to recognize and motivate existing community leaders to participate in the program, to deal with conflicts in the community and to utilize informal training techniques that actively involved community members. However, the technical back-up available for the communities was not adequate, the training of the volunteers did not fully involve them in the overall approach to the intervention, and the success of the volunteers in their communities was variable. Some of the training materials were highly successful while others were inadequately designed.

Limitations of the study

The observations in this paper are largely subjective; this report should then be viewed as largely hypothesis generating. Nonetheless, because certain aims were established at the onset of the intervention and because the record keeping by the trainers and organizing staff was constructed to enable evaluation of the success or failure of these aims, the experiences recorded here should be interpretable to outside audiences. It was for this reason that we included

Table 3. Activities undertaken by individuals and communities following intervention

Activities	Communities
Handwashing	
Individuals resolve to wash hands before preparing/eating food	25
Pitcher with water for washing next to kitchen/eating area	25
Garbage	
Garbage site clean-up:	14
Converted to vegetable garden	9
Converted to children's play area	5
Demarcation of isolated site for garbage	9
New garbage bin	1
Containment of animals away from food/play area	2
Clean-up of pond—conversion to fishery	1
Defecation	
Rotation for cleaning latrines	16
Community collection to hire latrine cleaner	3
Build pit latrine	2
Demarcation of isolated site for defecation	3
Purchase concrete rings for water-sealed latrines	5
Miscellaneous	
Repair drains	7
Build new drain	1
Build/repair tubewells	3
Place caps on water taps	1
Rotation for filling water pots from tap	10

the formulation of the training approach in our 'Materials and Methods' section rather than in the 'Discussion'. Finally, our aims and definitions of these aims may not be considered 'laudable' by all educators. For example, the fact that the intervention was based on three messages formulated by the organizing staff might appear to some educators to contradict our statement that the communities were involved in goal determination. However, the communities were responsible both for identifying and overcoming the barriers to the successful achievement of these initial goals and for defining all subsequent goals (e.g. converting garbage ponds to fisheries, garbage heaps to play areas). Moreover, since we have been explicit in the description and definition of our aims, readers should be able to interpret our actions and results accordingly.

Implications of findings

A summary of the successes and failures of our education program and suggested explanations for these outcomes follows below. The detailed description of our failures and reference to similar problems described in other programs should be of help to future project organizers. The tentative hypotheses for our failures and successes should be evaluated, if possible, with formal studies.

1. The inclusion of three distinctly different groups of training personnel in the intervention team (educated persons able to record and easily comprehend conceptual issues, community members without formal education but with a history of service to the community who were selected by the organizing staff, and community leaders who were already regarded as authority figures) resulted in the achievement of a diversity of goals that would probably not have been possible with a training staff of a homogeneous background.

2. The extensive introductory course was mandatory; in fact, a longer course with more involvement of all training staff would have been preferable. More supervised practical field experience [5] may have overcome the difficulty that the trainers had in focusing the intervention on the basic messages.

3. Development of the training materials by the staff was largely successful but more input from the volunteers [15], more field testing [5] and a greater variety of materials would have been preferable.

4. The mere availability of supplies and technical back-up was insufficient to permit the successful construction and implementation by the communities of sanitary facilities. Future programs might consider sending appropriate community members for specific technical training as has been done elsewhere [16]. This training however should occur *after* the identification of community leaders and *after* the community members have identified their needs, priorities and work plans to avoid an external imposition of goals on the communities.

5. The documentation by the trainers of their training efforts served not only as the basis for reporting the methods of our training approach but also as a very useful tool for exchanging ideas and experiences and modifying approaches within the program. In project settings without sufficient finances to afford an impact evaluation these no-

tations could be used as subjective descriptions of behavioural change. Alternatively, as a compromise between this method and the more costly method of continuous observation by objective observers, a system of periodic observations made on highly structured pre-coded observation forms by rotated trainers might be considered.

6. Continued visitation by the trainer was imperative to maintain the enthusiasm of the communities. Further, it was necessary to involve the many newly immigrated community members who had not been present for the intensive intervention.

7. The heavy reliance on local community members and volunteers resulted in a relatively low cost for the preparation and delivery of the educational intervention which should be affordable in most settings.

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