Research Paper

Process of developing education material on water, sanitation and hygiene (WaSH) and diarrhoea prevention and testing its acceptability among tribal mothers

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ABSTRACT

The study aimed to develop education material on WaSH practices and assess its content and acceptability. Online survey of 19 posters identified two Marathi posters that were not context- or setting-specific. A three-phased evaluation study was conducted to assess (i) WaSH practices of mothers attending an ANC centre (n = 40) and (ii) performed a quantitative content analysis of education material developed on WaSH (n = 38). Focus group discussions (FGDs) were employed for qualitative content analysis (n = 10). (iii) Acceptability was derived from the scores of quantitative content analysis. Relevance of content and use of fear appeal emerged as significant characteristics using qualitative content analysis. In quantitative content analysis, the maximum score for the domains pertaining to relevance and comprehension was 5 each and for the layout was 3. The mean scores for posters 1 and 2 were 4.34 ± 0.9 and 4.00 ± 1.1 for relevance; and 4.89 ± 0.3 and 4.95 ± 0.2 for comprehension, respectively. Acceptability ranging between 68 and 100% in all three domains for both the posters indicated high acceptability. Maximum acceptability score was obtained for comprehension followed by relevance and layout for both the posters. Tribal populations can benefit from these communication aids that are context- and setting-specific. These can be adopted with relevant cultural modifications to suit similar settings.

Key words | diarrhoea, health education, hygiene, sanitation, water

INTRODUCTION

Worldwide diarrhoeal diseases account for 1 in 9 child deaths, making diarrhoea the second leading cause of death among children under the age of 5 (Centers for Disease Control and Prevention 2017). In 2017, the estimated number of children with diarrhoea was 1.7 billion globally. Every year an estimated 525,000 children under five die of diarrhoea. Diarrhoea is also a leading cause of undernutrition in children under-five years of age (World Health Organization 2017).

India has made steady progress in reducing deaths in children under the age of 5, with total deaths declining from 2.5 million in 2001 to 1.5 million in 2012. Despite the progress, the proportional mortality accounted by diarrhoeal diseases still remains high (Lakshminarayanan & Jayalakshmy 2018). In India, NFHS 4 reports no decline in diarrhoea from 2006 to 2016 (International Institute for Population Sciences (IIPS) 2019). Thus, diarrhoea is the third most common cause of death in children under the
age of 5, responsible for 13% deaths in this age-group, i.e. killing an estimated 300,000 children in India each year (Lakshminarayanan & Jayalakshmy 2015). Although diarrhoea remains a major killer, it is largely preventable. Better water, sanitation and hygiene (WaSH) practices could prevent deaths of about 361,000 children under 5 years each year (World Health Organization 2018b). A large proportion of diarrhoeal diseases can be prevented through safe drinking water and adequate sanitation and hygiene (World Health Organization 2017). Since 2013, Lancet Maternal and Child Health Series (Black et al. 2013) has emphasized the need for strengthening nutrition-sensitive interventions such as WaSH. Among the common issues in developing nations, open defaecation is practiced by 892 million (World Health Organization 2018b). As per the 2011 World Bank Report, in India, about 6.4% of GDP has been lost due to poor sanitation (World Bank 2011).

In addition to this, Information, Education and Communication (IEC) is another cost-effective strategy to address public health issues. IEC material for diarrhoea should primarily focus on prevention and management. Management strategies mainly focus on feeding during infection and management of infections at the household level using oral rehydration solution (ORS) and zinc supplementation (UNICEF 2018). Communication material that exclusively focuses on the management of diarrhoea addresses only one half of the public health issue, while prevention strategies are less emphasized.

Tribal population in India is a marginalized and discriminated community. Their income and social status contribute to their vulnerability. Tribal settings are characterized by a lack of developmental facilities and inadequate primary health care. Compared to non-tribal regions, the educational achievement of the younger population is lesser in tribal regions; similar is the literacy and awareness of health among women. This is reflected in the poor nutritional status of women and children in these settings. Lack of data on the prevalence of diarrhoea among children in tribal region recognizes the need to study the prevalence in these settings (International Institute for Population Sciences (IIPS) 2007, 2016). Similar to the dearth in data on diarrhoea prevalence in tribal regions, there are few culturally appropriate communication materials that are relevant to bring about behaviour change in tribal settings. The factors associated with diarrhoea in a tribal setting include lack of environmental hygiene and safe drinking water, open defaecation and improper disposal of human excreta. Tribal communities are also known for their taboos and religious practices which are often associated with health and disease (Mishra 2012). Designing IEC materials that are culturally appropriate, comprehensive, and in the local language would prove useful in raising awareness about hygienic practices in these settings. Considering the low literacy and less usage of technology in day to day activities, the present study aims to develop posters on appropriate WaSH practices and assess its content and acceptability.

**METHODOLOGY**

**Study design**

A three-phased evaluation pilot study was performed.

1. **Phase I:** Designing the IEC material
2. **Phase II:** Content analysis by quantitative and qualitative methods
3. **Phase III:** Tested the acceptability of IEC material developed

**Phase I: designing the IEC material**

Three different strategies were employed for poster development. The first among this was an online survey to evaluate the available IEC material in the public domain. Two websites (a) National Rural Health Mission (NRHM) (Government of India 2019) and (b) United Nations International Childrens’ Emergency Fund (UNICEF) IEC e-warehouse (UNICEF 2019) were searched to assess posters that were specific to the theme of WaSH and diarrhoea prevention. A total of 19 posters were assessed for theme, content, language and relevance. The second was a literature search, to understand the steps in designing the communication material. The search facilitated in identifying the domains and choice of images relevant for a tribal setting. The third step involved situational analysis to understand the prevailing WaSH practices and identified gaps.
Researchers interviewed the participants in the local language (Marathi) explaining concepts wherever required. Responses obtained were applied to decide the content of posters. At the end of Phase I, gaps in the existing material, domains for poster design and the themes for two different posters were defined.

**Phase II: content analysis**

Qualitative content analysis: The objective of qualitative content analysis was to compare the developed posters with selected IEC materials available in the public domain. Among the existing communication material, a leaflet with information on both sides was chosen as the theme was relevant and the language was Marathi. Another poster on WaSH practices which was in Hindi was chosen as there were no Marathi posters relevant to the theme. Two FGDs were conducted among 10 mothers, one for each poster. Each FGD lasted for 60 min. Participants were exposed to posters developed by the research team and existing IEC material. The discussions were recorded through written worksheets. The participants were blinded to the source of the posters. Probing questions pertaining to WaSH practices shown in the posters, follow-up questions to obtain complete ideas and perceptions and exit questions to sum up the FGDs were included.

Quantitative content analysis: The objective of quantitative content analysis was to evaluate the developed posters based on the defined domains namely, relevance, comprehension and layout. A questionnaire containing 13 questions was used for this purpose.

**Phase III: acceptability**

The objective of this phase was to assess the acceptability of the IEC material developed. Acceptability was derived for the scores of quantitative content analysis performed in phase II. The mean scores obtained under the three domains namely, relevance, layout and comprehension were redistributed as per a three-point Likert scale to assess the degree of acceptability of the content developed. For those domains that had a maximum possible score (MPS) of 5, scores 4 and 5 were categorized as good, 3 as fair and <3 as poor acceptability. For domains with an MPS of 3, a score of 3 was categorized as good, 2 as fair and 1 as poor acceptability.

**Study setting**

The study was carried out in Pune in different settings, which included a university campus and an antenatal care (ANC) centre in a rural setting.

**Sampling method**

A purposive sample of evaluators comprised of (i) public health experts to provide technical inputs on the domains identified, (ii) janitors who were engaged in hygiene and sanitation work in the university campus, to obtain feedback on the comprehensibility of content and construct of the material developed and (iii) mothers attending a public ANC centre in Talegaon were recruited to assess the content of posters and to pilot test the effectiveness of communication material in changing knowledge and attitude among the intended participants. After obtaining inputs from all levels, appropriate changes were made in the poster to achieve the intended objective.

**Sample and sample size**

In phase I, posters developed by public agencies were studied. In all 19 posters which were relevant to WaSH theme were analysed. For situation analysis, data on WaSH practices were collected from 40 mothers attending an ANC centre. In phase II, content analysis was performed quantitatively among 10 public health experts, 5 housekeeping employees and 25 mothers, and qualitatively through 2 FGDs among 10 mothers (who were a subset of the 25 mothers from quantitative content analysis). In phase III, acceptability was assessed from the scores obtained from the quantitative content analysis. In all, the sample comprised 63 mothers, which is greater than 10% of the larger proposed study which requires a sample of 540 participants.

**Inclusion and exclusion criteria**

All participants who consented to participate were included in the study. Participants who had prior exposure to WaSH interventions were excluded from the pilot test.
Data collection tool

A questionnaire comprising three sections was designed to collect data on quantitative parameters. The first section comprised 7 questions pertaining to WaSH practices of the participants which was used to develop the posters in phase I. The second section on content analysis comprised 13 questions pertaining to (a) relevance, (b) comprehensibility and (c) layout. The third section for pilot test comprised of 10 questions that were used before and after the posters were explained to the participants.

Data analysis

Quantitative analysis was done using the Statistical Packages for Social Sciences (SPSS) version 19. Data were analysed for frequency and percentages (descriptive statistics). Scores for 3 domains (i.e. relevance, comprehension and layout) were calculated and compared with MPS for each domain to evaluate the content of the posters. Percentage acceptability was derived from the quantitative content analysis after categorizing as per Likert scale. Recordings from FGDs were assessed qualitatively for the defined themes.

RESULTS

Phase I: designing IEC material

Online survey of posters: Of the 19 posters surveyed online, which were selected based on their relevance to WaSH theme, two were in Marathi while others were either in Hindi, English or other regional languages. In one of the chosen websites, communication material was available under specified themes that included home hygiene, toilet construction, general diarrhoea, school sanitation, community management of water sample and drinking water safety while the second had material on infection control and hand washing. Analysis of the posters revealed the following: most of the posters that were taken from websites addressed one specific theme such as hand washing or garbage disposal, technical terms such as alcohol and antibacterial soap solution were used. Two posters had multiple themes that included household cleanliness, drinking water use and storage including images on hand washing. With respect to language, only two IEC materials on diarrhoea management were available in Marathi. Of these, one was a game and the other focused only on ORS and zinc with cartoon characters. Although some images were inappropriate, they were also not specific to a tribal setting. For instance, washing animals in water bodies was not observed in any of the posters. There was an explicit need to develop specific posters to meet the needs and characteristics of the tribal population. Posters from other sites showed the use of water filters that are not cost-effective public health interventions for a tribal setting. None of the posters addressed why these practices need to be followed. Situation analysis: Table 1 indicates the WaSH practices of the study participants in their setting. All study participants (100%) reported that they washed their hands before cooking food and after defaecation. Almost 97% of the study participants reported that they filtered water before drinking and 88% boiled water before drinking. Similarly, about 88% disposed of the garbage in common disposal bins. About 8% of the participants threw human or animal excreta in the open areas/field. Almost 63% of the participants gave ORS to their children during diarrhoea.

Development of posters

After assessing the available online posters and identifying the gaps in WaSH practices through situational analysis, two posters were developed with specific objectives.

<table>
<thead>
<tr>
<th>No.</th>
<th>Question (N = 40)</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Do you filter your water before drinking?</td>
<td>97.5</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>Do you boil your water before drinking?</td>
<td>87.5</td>
<td>12.5</td>
</tr>
<tr>
<td>3</td>
<td>Do you dispose of your garbage in common disposal bins?</td>
<td>87.5</td>
<td>12.5</td>
</tr>
<tr>
<td>4</td>
<td>Do you throw human/animal excreta in the field/open place?</td>
<td>7.5</td>
<td>92.5</td>
</tr>
<tr>
<td>5</td>
<td>Do you wash your hands before cooking food?</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Do you wash your hands with soap after defaecation?</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Last time when your child had diarrhoea did you give ORS?</td>
<td>62.5</td>
<td>37.5</td>
</tr>
</tbody>
</table>
The themes of the posters were chosen to be (a) causes of diarrhoea, its prevention and management, (b) water sanitation and hygiene practices for the prevention of diarrhoea.

Images from different search engines were used and duly acknowledged for duplication. Related scientific content on the above themes was referred from standard guidelines by CDC, WHO and UNICEF (UNICEF 1998; World Health Organization 2014, 2018a). The posters were designed in English and the content was then translated to the local language (Marathi). Care was taken to ensure that both the images and language used were context-specific namely, content and images appropriate for the setting, theme-specific and comprehensible to the tribal population. The dimensions of each poster were 32″ × 24″. The posters were printed on waterproof material to ensure durability in tribal settings.

Dimensions and layout: The layout of poster I that emphasized diarrhoea prevention was designed with five sections that included (i) burden of diarrhoea and its consequences, (ii) signs and symptoms, (iii) public health measures to treat diarrhoea, (iv) favourable and (v) unfavourable practices. In all, poster I had 9 images and supporting written material not exceeding 120 words. In addition, signs were used to show favourable and unfavourable practices to make it comprehensible for those unable to read the text. Poster II that focused on healthy WaSH practices comprised of 3 sections each comprising of strips/series of images: (i) water treatment and storage at the household level, (ii) safe sanitation practices and (iii) practices to ensure personal hygiene. In all, poster II had nine images and supporting written material not exceeding 60 words.

Phase II: content analysis

Phase II of the study analysed the content of the two posters developed in phase I.

Results of qualitative content analysis

The results of the comparison between the existing communication material and the ones developed are discussed here. The IEC material which was selected from the IEC e-warehouse was appreciated for the content as it included source of water, storage, cleanliness, garbage disposal, washing of hands and human waste disposal. Signs used for do's and don’ts were well appreciated. However, images such as construction of toilets received comments such as ‘irrelevant’. For most of the participants, Hindi as a language was not comfortable despite both languages sharing the same script. The most common mention was the imbalance between the written text and images with more of written content.

Participants had specific concerns on the images not being relevant to tribal settings. For instance, washing hands was common but with soap was uncommon. They reported ash was mostly used rather than soap. They suggested that the above should be mentioned as a wrong practice. Across groups, the participants felt that building toilets was the responsibility of the government.

The posters prepared by the research team were appreciated for layout, spacing and a good balance of pictures and written content. The concept of WaSH was positive and acceptable by all participants regardless of their understanding or familiarity with these terms (‘Swachh’ in Marathi). Linking WaSH practices with health or disease received a positive feedback for the second poster developed by the researchers. There was agreement among groups for the importance of fear appeal in poster I. ‘I did not know that so many children die due to diarrhoea’ was the response of one mother. ORS depicted in poster II was appreciated as it would serve as a reminder for them; however, feedback such as ‘ORS is written in the poster but is not always available when there is a need’ revealed gaps in programme delivery.

Above all, participants felt that water should be made available at home for successful WaSH practices. They explained the cumbersome process of boiling water in the rainy season when the firewood is wet for burning.

Results of quantitative content analysis

Tables 2 and 3 describe the distribution of scores for the content analysis of posters I and II as per the 3 domains (i.e. relevance, comprehension and layout). For both the posters I and II, more than 75% of the participants scored relevance between 4 and 5, where 5 was the MPS. All participants (100%) scored comprehension between 4 and 5, where 5 was the MPS. For layout, almost 95% of
participants and for poster II, 100% participants scored between 2 and 3, where 3 was the MPS.

Table 4 indicates mean scores of 3 domains for posters I and II. The scores for poster I were $4.34 \pm 0.9$ for relevance, $4.89 \pm 0.3$ for comprehension and $2.63 \pm 0.5$ for layout. In poster I, comprehension scored better as compared to the other 2 domains (i.e. relevance and layout). The scores for poster II were $4.00 \pm 1.1$ for relevance; $4.95 \pm 0.2$ for comprehension and $2.95 \pm 0.2$ for layout.

**Phase III: acceptability**

Table 5 provides the acceptability scores of posters I and II as per the domains namely, relevance, comprehension and layout. Acceptability ranging between 68 and 100% for all three domains for both the posters indicated good acceptability. Among the three domains, the maximum score was observed in comprehension followed by relevance and layout. Maximum acceptability scores under fair category were obtained in the layout of poster I (26%). Poor acceptability obtained the least scores in all three domains.

**DISCUSSION**

The content for the communication material was developed by following standard guidelines (UNICEF 1998; World Health Organization 2014, 2018a). Guidelines and existing literature emphasize the need to develop communication material for specific groups identified as vulnerable (Mahapatra 2014). Our study describes the methodology in developing IEC material for a vulnerable group, specifically for a tribal setting. This region lacks household water supply and sanitation. Despite the government’s effort to provide toilets, open defaecation is a common feature. These areas are disease prone, intertwined with poor literacy and poverty. This combined with limited knowledge and unsafe hygienic practices identify them as vulnerable for water
prone infections (Goodland 1982; Mishra 2012; Shrivastava & Ramasamy 2013). The guidelines for the development of IEC materials suggest an understanding of target audience, their attitudes, beliefs, values and past behaviour (Clift 1998; World Health Organization 2014). Through situation analysis, we assessed the awareness on diarrhoea prevention and safe WaSH practices among the participants. The results identified poor awareness about water as a source of infection and ill health. Literature suggests that printed media are suitable for imparting specific information compared to other communication media (Pinfold 1999). Therefore, in this study, we developed posters as an information dissemination tool, keeping in mind the resource constraints and the general practices in a tribal setting.

Literature evidence on the development of education material and its content analysis specifically for a tribal setting is scarce. While most of the available studies assessed the content of the material in similar settings, our work tested the materials at three different levels namely, (a) experts, (b) workers engaged in hygiene and sanitation work and (c) mothers residing in the tribal community. Communication materials developed for health promotion, use specific or a combination of the theoretical approach using established facts. Among these, fear appeal has been established as an important prevention strategy, when combined with simple preventive measures to improve health behaviour and outcome. Our material used fear appeal by highlighting the number of deaths due to diarrhoea among children under 5 using the guidelines provided by WHO/CDC (UNICEF 1998; Centers for Disease Control and Prevention 2017; World Health Organization 2018). Additionally, the posters also provided guidance for treating water, proper hand washing techniques and disposal of garbage.

Table 4 | Mean, maximum and minimum scores of 3 domains for posters I and II

<table>
<thead>
<tr>
<th>Categories of acceptability</th>
<th>Relevant (MPS = 5)</th>
<th>Comprehension (MPS = 5)</th>
<th>Layout (MPS = 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 38</td>
<td>Actual score MPS</td>
<td>Actual score MPS</td>
<td>Actual score MPS</td>
</tr>
<tr>
<td>Poster I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>4.34 ± 0.93</td>
<td>4.89 ± 0.31</td>
<td>2.63 ± 0.58</td>
</tr>
<tr>
<td>Minimum</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Poster II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>4 ± 1.18</td>
<td>4.95 ± 0.22</td>
<td>2.95 ± 0.22</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Maximum</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

MPS = Maximum possible score.

Table 5 | Acceptability scores of posters I and II as per the domains

<table>
<thead>
<tr>
<th>Acceptability scores in %</th>
<th>Relevance (MPS = 5)</th>
<th>Comprehension (MPS = 5)</th>
<th>Layout (MPS = 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categories of acceptability</td>
<td>Poster I</td>
<td>Poster II</td>
<td>Poster I</td>
</tr>
<tr>
<td>Good</td>
<td>84.2</td>
<td>76.3</td>
<td>100</td>
</tr>
<tr>
<td>Fair</td>
<td>7.9</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Poor</td>
<td>7.9</td>
<td>13.3</td>
<td>-</td>
</tr>
</tbody>
</table>

MPS = Maximum possible score.

Likert scale for MPS 5: 4 and 5 = Good; 3 = Fair; ≤2 = Poor.
Likert scale for MPS 3: 3 = Good; 2 = Fair; ≤1 = Poor.
technology-based tools in tribal settings. Pinfold had earlier suggested using bacterial slides for this purpose (Pinfold 1999). We intend to use a frugal tool, an origami microscope (foldscope) to show the organisms in water to create awareness.

Exclusive breastfeeding, practising appropriate hygiene practices and ensuring the safety of drinking water are established strategies for diarrhoea prevention (WHO 2017). Our content focused on the above strategies with a balance of images and written text. The language and images used were context-specific, where Marathi words in common usage in tribal settings to specify WaSH terms were used. Successful communication has been documented in various areas of scientific research by adhering to context-specific approaches (Newby et al. 1995; Corneli et al. 2006).

We have used a combination of qualitative or quantitative approaches for content analysis. In quantitative methods, we classified and scored the domains and further analysed them statistically. While in qualitative approach, we assessed the various domains in comparison to existing IEC material by NRHM and UNICEF. The factors commonly used to assess communication material included attractiveness, relevance, understanding the medium of communication and sustainability of communication process (Moloy Chaki 2015). The domains used in our study were relevance, comprehensibility and layout and the materials were prepared in the native language, Marathi. Our study revealed that, among the domains assessed for content, comprehension scored first in both posters, followed by layout and relevance. Assigning relevance to the content is achieved by designing messages to meet the communication objectives. Our study scored high in relevance as well. Under comprehension, the following questions were rated higher by the participants: (i) theme of poster, (ii) ability of the message to attract and retain interest, (iii) the clarity of message, (iv) motivating a desired behaviour and (v) ease of comprehension at all levels. Providing correct information is emphasized by communication strategy documents on WaSH (Government of India 2013). The posters developed scored less in questions pertaining to conveying unintended messages, incorrect or distracting or offensive information.

Acceptability of IEC materials has been widely tested in earlier studies. It is essential to test the acceptability of newly developed IEC materials to achieve effective learning and widespread utility among frontline workers. Our results indicated that while participants responded favourably to both posters, poster II scored above 75% good acceptability in all three domains. Despite this, few areas (mainly relevance) indicated fair or poor acceptability for poster II. Using a single medium (here a print medium) to achieve high acceptability is a challenge. This calls for supplementary techniques to complement the existing IEC material. As per the WHO framework, the relevance of communication material could be improved by focusing on customizing communication for the intended groups, keeping the audience beliefs in focus, or by reflecting on previous experiences (WHO 2017). Other studies have assessed the acceptability of different types of communication materials, such as narrative films or print material such as textbook content, etc. (Mengel 1986; Moran et al. 2016). These studies also suggest the revision of the material and combination of interventions to improve knowledge or awareness among the participants (Mengel 1986; Mahapatra 2014).

CONCLUSION

Tribal populations can benefit from communication aids that are context- and setting-specific. Posters that explain the risk of diarrhoeal infection and its prevention using appropriate images and language would be of practical utility for community health workers and can be adopted with relevant cultural modifications to suit similar settings. Supplementary methods appropriate for tribal setting need to be adopted to improve acceptability in selected domains.

REFERENCES


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