

Home fortification in emergency response and transition programming: Experiences in Aceh and Nias, Indonesia

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Abstract

Background. Improving the nutritional status of an emergency-affected population is essential, because undernutrition increases infection risk and is linked to more than 50% of childhood deaths in developing countries. Emergency food aid addresses nutritional needs, including micronutrient deficiencies, but is provided only for a limited time and uses few items, so the needs of specific target groups are often not fully met.

Objective. To describe the post-tsunami experience with distribution of Vitalita Sprinkles in Aceh and Nias and to analyze the monitoring data gathered for the emergency response.

Methods. International agencies such as Helen Keller International and partners provided micronutrients in response to the tsunami emergency in Aceh and Nias and to analyze the monitoring data gathered for the emergency response.

Results. In March and April 2006, the percentage of children aged 6 months to 59 months who had consumed Vitalita in the previous month was more than 70% in 5 of 11 districts evaluated, 40% to 70% in another five districts, and 32% in one district. An independent survey found 25% less anemia among recipients. Almost all mothers interviewed during March to April 2006 (96.3%) had heard about Vitalita and recognized its packaging, 69% said that Vitalita contained vitamins

for under-fives, 86% knew the appropriate target group for Vitalita, and 83% said it had to be mixed with solid food. Of the 26% that reported not having given Vitalita to their child in the last month, 90.5% said that their child did not like it.

Conclusions and lessons learned. Because the product, including its concept, was new, appropriate information and training was required as well as a thorough introduction to the beneficiaries, particularly on proper use, to ensure acceptance. This experience demonstrates that providing micronutrients as part of emergency relief and transition programming, as recently recommended by the World Health Organization/UNICEF/World Food Program, is feasible.

Key words: Emergencies, home fortification, multi-micronutrients, Sprinkles, tsunami relief

Introduction

In response to the emergency caused by the earthquake and ensuing tsunamis on December 26, 2004, in Southeast and South Asia, relief efforts were initiated to prevent further loss of life from disease and undernutrition. Both health care and food aid are essential components of first-line emergency response, in addition to the provision of shelter, sanitary facilities, and clean drinking water. Since undernutrition, including vitamin and mineral deficiencies, has been linked to increased risk of infection and to over 50% of childhood deaths [1–4], the quality, as well as the quantity, of the food provided in emergency relief is vital to decrease the risk and severity of infectious diseases and related mortality.

In particular, vitamin A is well known for its impact on mortality (among the target group of children aged 6 to 59 months, the reduction in mortality is 40% for diarrhea, 50% for measles, and 23% overall) and for its impact in reducing the severity and duration of morbidity [1]. Zinc is recommended as adjunct therapy

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for treatment of diarrhea, as it reduces the duration and severity of the episode as well as the possibility of another diarrhea episode within the next few months [3, 5]. Because zinc also reduces the incidence of pneumonia and malaria and enhances immune function, it has also been recommended for prevention of morbidity [3]. Other vitamins and minerals, such as iron, iodine, and B vitamins, are also important for preventing or reducing the severity of morbidity and for improving health, development, and physical performance [2, 6].

Vitamins and minerals can be provided in the form of naturally micronutrient-rich foods, fortified food, fortificants for home fortification, or supplements. Major agencies involved with providing emergency relief have adopted a planning figure for food aid that aims to protect minimal metabolic functions (at a minimalist "starvation-avoidance" level) and to reduce mortality by correcting preexisting nutritional deficiencies and allow for the physical activity necessary to be able to access the food [7]. The main commodities used for providing micronutrients are fortified foods, such as fortified wheat and maize flour and their products (fortified noodles and fortified biscuits made from wheat flour), vegetable oil fortified with vitamin A, iodized salt, and fortified blended foods, such as corn-soya blend [8]. Because the choice of food items is limited and there are issues around supply and logistics of providing specific food items, provision of a food basket with adequate micronutrient content is constrained and hence the needs of some target groups or individuals are not fully met. Provision of additional vitamins and minerals can ensure that the needs of the most vulnerable groups are met.

The distribution of vitamins and minerals in emergencies and transition programming for children aged 6 to 59 months and pregnant and lactating women is now recommended in the World Health Organization/UNICEF/World Food Program statement "Preventing and controlling micronutrient deficiencies in populations affected by an emergency" [9]. For children aged 6 to 59 months, vitamins and minerals are recommended to be provided at the level of 1 recommended nutrient intake (RNI) per day where no fortified foods are provided, and 2 RNIs per week where such foods are being provided. This does not mean, however, that this statement should be implemented in every population affected by an emergency; priority should be given to those with preexisting deficiencies (i.e., the populations of most developing countries), and it is important to assess needs for and sources of micronutrients.

A recent World Health Organization (WHO) Expert Consultation cautions against providing iron supplementation to infants and young children in severely malaria-endemic areas, including home fortificants

(but not fortified foods), where no good malaria control program is in place [10]. In the case of Aceh and Nias, malaria exists, but only in specific areas, and is generally not severe; furthermore, the health care that was provided after the tsunami addressed malaria. The cost of vitamin and mineral preparations is low, they are easily transported and stored, little or no preparation is required since they are either swallowed directly or mixed with small volumes of fluid or food, and their distribution provides a gateway for assessment of other needs and provision of additional services.

Based on these considerations and previous experience with micronutrient programming, Helen Keller International and partners initiated the provision of vitamins and minerals in response to the December 2004 tsunami emergency and the March 2005 earthquakes in Nanggroe Aceh Darussalam (Aceh) and North Sumatra (Nias Islands), Indonesia [11, 12], known as the Supplementation with Micronutrients (SUM) program. Vitamins and minerals were provided in the form of four preparations: high-dose vitamin A capsules, zinc tablets as adjunct treatment for diarrhea, iron-fortified soy sauce, and multimicronutrient powder (Sprinkles) for home fortification.

Between January 2005 and April 20, 2006, the parents or caretakers of more than 200,000 infants and young children each received 30 to 210 sachets of Vitalita Sprinkles. The Sprinkles Global Health Initiative at the Hospital for Sick Children in Toronto conceived the strategy of home fortification with Sprinkles—single-dose sachets containing micronutrients in a powdered form, which are easily sprinkled onto any foods prepared in the household [13]. In Sprinkles, the iron (ferrous fumarate) is encapsulated within a thin lipid layer to prevent it from interacting with food. This means that there are minimal changes to the taste, color, or texture of the food upon addition of the micronutrient powder. Vitalita Sprinkles contain 1 RNI (adapted from the recommended dietary allowance [RDA] in the United States and Canada for children aged 6 to 11 months and 1 to 3 years) [14, 15] of 14 vitamins and minerals, including iron. Each sachet contains one daily dose of 375 retinol equivalents (RE) of vitamin A, 5 mg of zinc, 10 mg of iron, 150 µg of folic acid, 50 µg of iodine, 35 mg of vitamin C, 5 µg of vitamin D, 6 mg of vitamin E, 0.5 mg of vitamin B₁, 0.5 mg of vitamin B₂, 6 mg of niacin, 0.5 mg of vitamin B₆, 0.9 µg of vitamin B₁₂, and 0.6 mg of copper. Any food can be fortified with the single-dose sachets, hence the term "home fortification."

Use of a multimicronutrient powder for home fortification as a component of an emergency response has not previously been described. The experience with the distribution and use of Vitalita Sprinkles in Aceh and Nias is the focus of this paper.

Methods

Program implementation

The SUM program was implemented from January 2005 until May 2006 and progressively involved 15 districts in Aceh and North Sumatra affected by the tsunami and earthquakes, aiming to reach most of the 790,000 people that the World Food Programme (WFP) estimated to be in need of food assistance because of the tsunami [16]. In January 2005, the SUM program started in Banda Aceh and Aceh Besar; in March it was expanded to Aceh Utara and Bireun; in April the districts of Lhokseumawe, Pidie, Aceh Jaya, Aceh Barat, Simeulue, and Nias were added; and in May Nagan Raya joined. In September the program was further expanded to include Aceh Selatan and Aceh Timur, and in November to include Aceh Barat Daya and Nias Selatan. The program aimed to reach all those affected by the tsunami, whether living in camps, with host families, or in their own accommodation, who were cut off from many services due to disrupted infrastructure and a collapse of many services, and all of whom are collectively referred to as IDPs (internally displaced persons).

Through a collaboration with partners, vitamin and mineral preparations were provided monthly to the IDPs, including 20 sachets (16 mL each) of iron-fortified soy sauce for every three persons in a household, 30 sachets of Vitalita Sprinkles (*Vitalita* means "vitamins for under-fives" in Bahasa Indonesia) for each child aged 6 months to 12 years, and a vitamin A capsule for each child aged 6 months to 12 years who had not received one since the tsunami struck or, from September 2005 onwards, in the preceding 6 months. Dispersible zinc tablets were distributed to the health centers and clinics to be provided as adjunct treatment for diarrhea (10 tablets to be given per case of diarrhea for home treatment) [5].

Social marketing materials as well as training materials were developed to provide people with further information on health and nutrition in general and on the four vitamin and mineral preparations in particular. From January 2005 to April 2006, 7,583 people from the provincial, district, and subdistrict levels were trained, including staff from government health divisions (doctors, nutritionists, midwives, and other health officials), health volunteers from clinics and village health posts, staff from the government's Family Welfare Movement (PKK), hospital staff, and local and international non-governmental organization staff.

Program monitoring and evaluation

Program monitoring and evaluation was conducted to assess program implementation as well as the outcome of the SUM program. At the beginning of the program,

a camp would receive one visit of two teams at the same time, one team to distribute the micronutrient preparations and one team to collect monitoring and evaluation data. Later on, when partner organizations became increasingly involved in the distribution, distribution of vitamin and mineral preparations and data collection were conducted separately.

Data were collected by 192 field staff who were mainly Acehnese and had graduated from schools of dietetics, agriculture, or related fields. There were one or two teams of data collectors in each district, each team consisting of four to eight people. Data-collection activities in each district were led by a field coordinator who had previous working experience with the Government of Indonesia/Helen Keller International Health and Nutrition Surveillance System in other parts of Indonesia. All data collectors received 7 days of training before they started field activities and refreshment training before continuing to the next round of data collection. The training focused on data collection, including taking anthropometric measurements, and provided information on the vitamin and mineral preparations, their benefits, and good nutrition practices.

Data were collected at the camp, barrack, household, and individual levels. The data reported here are from the latter two levels. A household was defined as consisting of at least a mother and her child. Household-level information was usually collected from the mother and focused on program implementation aspects (e.g., having noticed social marketing materials on vitamin and mineral preparations, knowledge of how to use the preparations (i.e., Sprinkles, iron-fortified soy sauce, and zinc) and their benefits), evidence of the need for the program (food consumption, health status), and achieving the aims of the SUM program (coverage of preparations, consumption of preparations, and health and nutrition status). Selection of individuals and households for data collection was done as follows. At the first data collection in a district, anthropometric measurements were taken and data on health, nutritional status, and coverage of vitamin A capsules, zinc tablets, and Vitalita Sprinkles were collected from all women of reproductive age and all under-five children available in the camp or barrack visited. Information on family circumstances (living conditions, services received, and so forth) was collected for a subsample of 10% of children under 5 years of age, with a minimum of nine per camp. For most households, information about their shelter as well as the camp was also collected. Every 3 to 4 months, data collection in a camp was repeated. During these subsequent rounds of data collection, anthropometric measurements were taken and information on health, nutrition, and coverage of services was collected from 50% of the under-five children as well as school-age (5 to 12 years) children who were available at the camp.

Household and maternal information was collected from 5% of the children's households.

Between January 2005 and April 2006, a total of 2,146 camp visits were made for data collection, during which data were collected on 54,374 households and 104,691 children aged 0 to 12 years. That number of children was more than 50% of the children of this age among the IDP population (the total IDP population was estimated at 790,000, with approximately 25% consisting of children aged 0 to 12 years [16]), although some children would have been assessed more than once. In this paper, we report on the data that were collected from children aged 6 to 59 months in the first 11 districts that were involved in the program ($n = 52,746$). Data from the districts Aceh Selatan, Aceh Timur, Aceh Barat Daya, and Nias Selatan are not reported because activities in these districts were started later in September 2005.

Field teams were instructed to explain the purpose of the data collection to each child's mother or caretaker, and data collection proceeded only after written informed consent had been obtained. Participation was voluntary, and the subjects were free to withdraw at any stage of the interview or measurement. The ethical review board of Syakuala University, Banda Aceh, approved the data collection, including assessment of hemoglobin concentration.

Statistical analysis

Descriptive statistics on coverage, use, and knowledge are expressed as percentages. For analysis of an impact of the intervention on anemia, forward conditional logistic regression analysis was used with data collected within two-month periods, in order to avoid a time effect, with the following independent variables: district, age of child, cumulative number of Vitalita sachets consumed in categories (none, 1–30, 31–60, etc.), receipt of vitamin A capsules since the tsunami, and maternal education as an indicator of socioeconomic status. A p value $< .05$ was considered statistically significant. Data were analyzed by SPSS for Windows version 11.5.

Results

When the plans for the SUM program were made, efficacy studies and a pilot program using Vitalita Sprinkles had already been implemented by Helen Keller International, Church World Service, local nongovernmental organization partners, and the Government of Indonesia in other parts of Indonesia since 2003 [17, 18]. Thus, packaging, information materials, and training activities had already been developed. In addition, Vitalita Sprinkles were already being produced in the country by PT Heinz ABC Indonesia, so that 200,000

sachets could immediately be diverted for the tsunami response. Once funding for the SUM program had been secured by the end of February 2005, an order for 15 million Sprinkles sachets was placed, and 6 to 8 weeks later the factory delivered the first batch of a couple of million sachets, information-education-communication (IEC) materials had been produced, and training and distribution were started. Thus, distribution of Sprinkles "at scale" started about 4 months after the tsunami. **Figure 1** shows the cumulative number of Vitalita sachets distributed between January 2005 and April 2006.

Because the program was gradually expanded to include more districts, the number of Vitalita sachets received per beneficiary over time, according to the mother or caretaker, varied among districts, as shown in **figures 2A** and **B**. In some districts, such as Aceh Utara, Bireun, Lhokseumawe, and Pidie, most children aged 6 to 59 months had received more than 150 sachets within a year after the tsunami, whereas in other districts, such as Aceh Barat, Nagan Raya, Nias, and Simeulue, the numbers received were lower and more variable. **Figure 2** also shows that from approximately 5 months after the tsunami, coverage was above 90% in almost all districts enrolled in the program. Although coverage was very high, **figure 3** shows that the proportion of children aged 6 to 59 months who had consumed 30 or more sachets in the month preceding the interview ranged from 2% to 46%, and the proportion who had not consumed Vitalita ranged from 0% to 67%. Consumption was highest in Bireun, Pidie, and Simeulue and lowest in Banda Aceh, Aceh Barat, and Aceh Besar.

More detailed information about perception, knowledge, and use of Vitalita was collected during March and April 2006 from all mothers or caretakers of children sampled in all districts from whom household information was collected ($n = 4,782$). The great majority of mothers interviewed (96.3%) had heard about Vitalita, and 94.5% recognized the picture of Vitalita

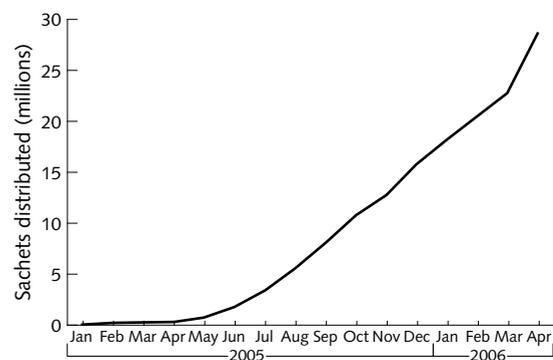


FIG. 1. Cumulative number of single-use sachets of Vitalita Sprinkles distributed to internally displaced persons in Aceh and Nias between January 2005 and April 2006

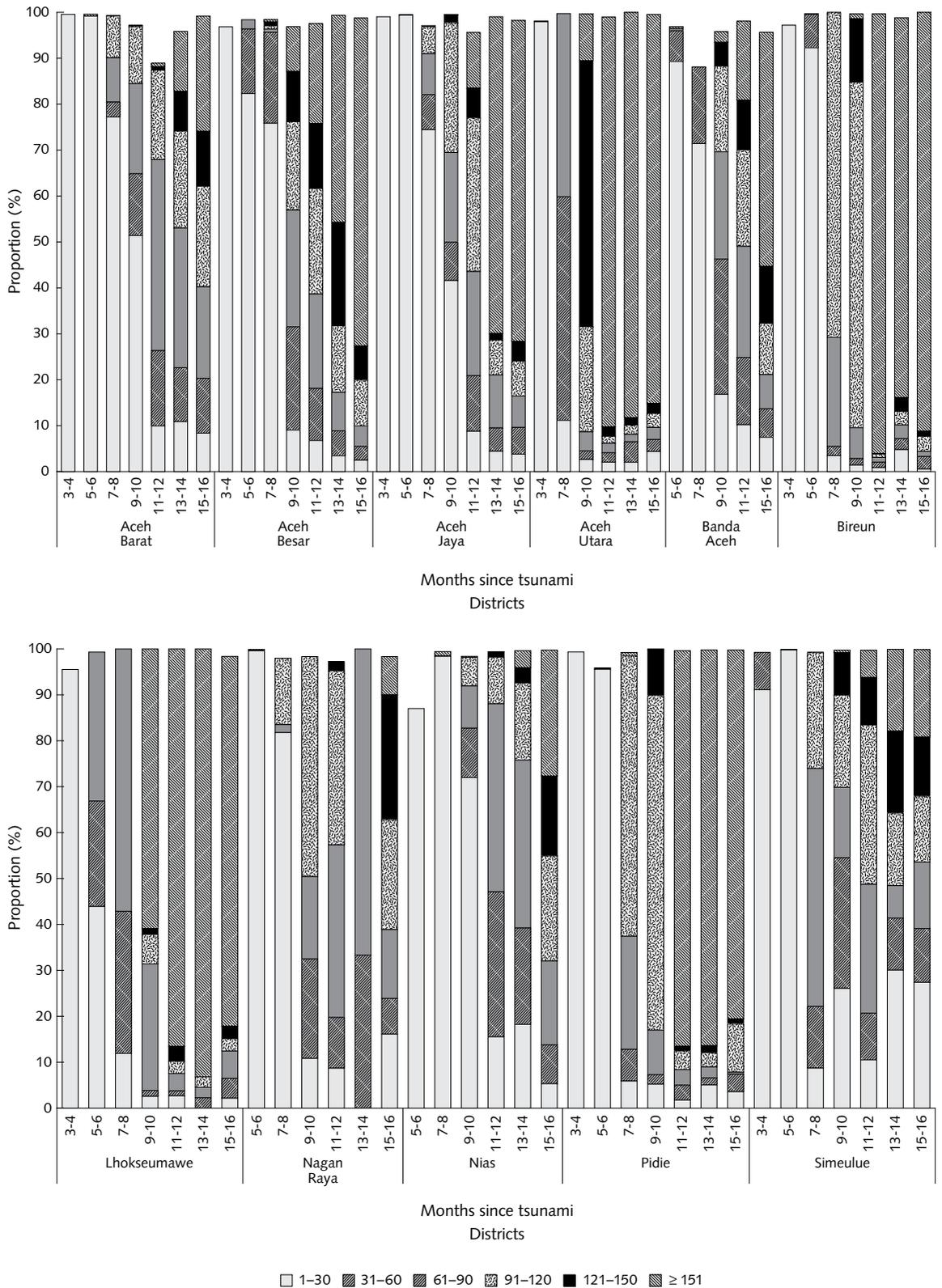


FIG. 2. Number of sachets of Vitalita Sprinkles received by children aged 6 to 59 months according to time since the tsunami, per district ($n = 49,456$)

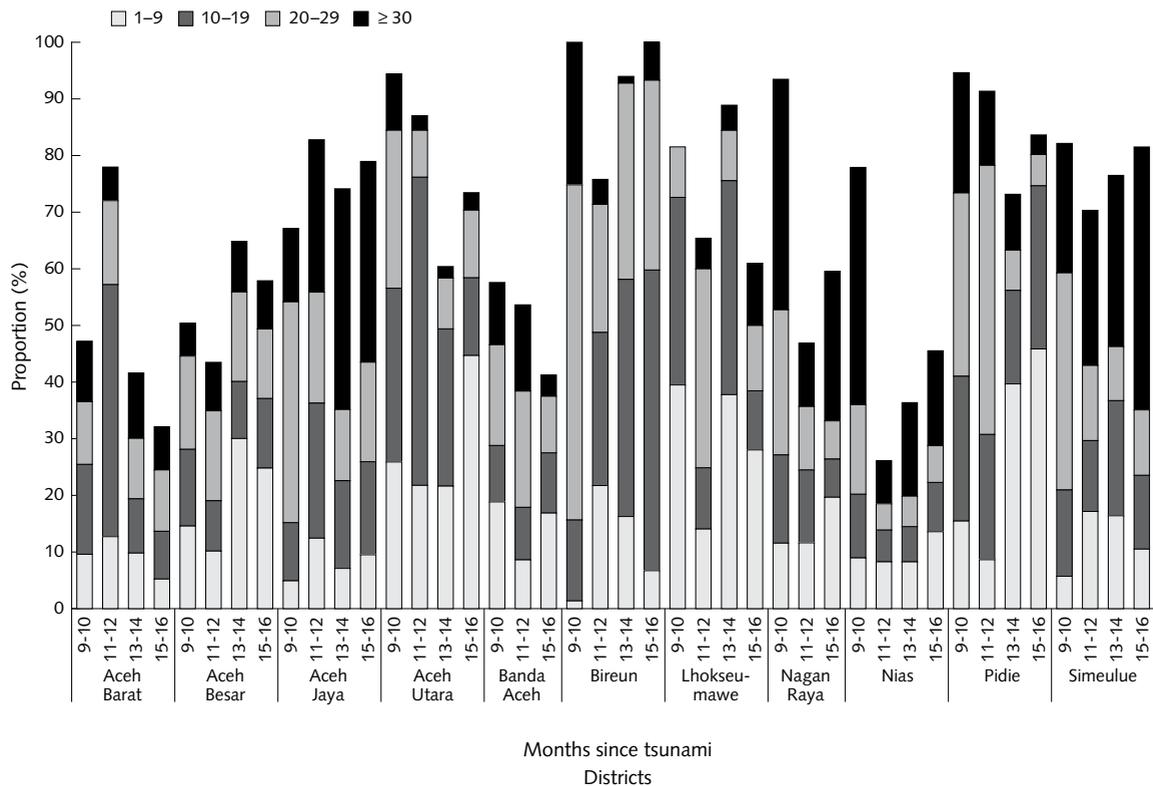


FIG. 3. Number of Vitalita sachets consumed by children aged 6 to 59 months according to time since the tsunami, per district; information on number consumed was collected starting from month 9 after the tsunami ($n = 23,680$)

when it was shown to them. They reported having seen it on posters, brochures, stickers, and banners, as well as in other promotion materials (table 1). More than 69% of all mothers interviewed said that Vitalita contained vitamins for under-fives, 11% said that it was a mixture of vitamins to be added to food, 9% said that it was for improving the appetite, and only 8% did not know about or had not heard of Vitalita. Most mothers also knew the appropriate target group (table 2), with only 8% saying that they did not know and 6% saying that Vitalita was also for infants younger than 6 months. Table 2 also shows that when asked about how Vitalita should be used, 83% said that it had to

TABLE 1. Proportion of mothers who reported having seen promotional material on Vitalita sprinkles in response to an open-ended question ($n = 4,522$ to 4,536)

Promotional material	% of mothers
Poster	63.2
Brochure	56.2
Sticker	39.1
Banner	32.9
Calendar	5.1
Other (box, flyer, T-shirt)	18.4
Did not see any promotional material	1.5

be mixed with solid food, 30% said that the food to which it was added should not be hot, and less than 2% thought that it could be mixed with liquids. Of the 26% that reported not having given Vitalita to their child during the previous month, the majority (90.5%) said that their child did not like it.

Discussion

The experience with distributing more than 28 million sachets of Vitalita Sprinkles to more than 200,000 children in Aceh and Nias has shown that the concerted effort, involving many partners, enabled the SUM program to achieve a very high coverage as well as to inform the population very well on the benefits, use, and appropriate target group for Vitalita Sprinkles. The latter was achieved through an intensive social marketing campaign and a thorough training program involving over 7,500 Government of Indonesia and partner staff, as well as volunteers from the communities. Considering that the product as well as its concept (home fortification using a powder of multivitamins and minerals) was completely new to the population, its acceptance and utilization among the population was very high. In the last 2 months of the program (15

TABLE 2. Proportion of mothers who reported that they knew the target groups for *Vitalita* sprinkles and how Sprinkles should be prepared in response to open-ended questions ($n = 4,582$ to $4,594$)

Question	% of mothers
Target groups	
Infants < 6 mo	5.9
Infants 6–11 mo	46.5
Children 1 to < 5 yr	69.2
Children 5–12 yr	47.8
Other (young children, children under 5, children)	11.0
Do not know	8.0
How to prepare Sprinkles	
Once a day	49.1
Not with hot food	29.9
Mix with liquid	1.9
Mix with solid food	82.7
Other (mainly, mix with rice)	15.0
Do not know	2.6

to 16 months after the tsunami), in 5 of the 11 districts evaluated, more than 70% of children aged 6 to 59 months had consumed *Vitalita* in the previous month; in another 5 districts, 40% to 70% had consumed *Vitalita*; and in 1 district, 32% had consumed *Vitalita*. Coverage was high, and thus the quality of the diet of many children was improved by increasing its vitamin and mineral content.

The impact of *Vitalita* Sprinkles on iron-deficiency anemia was demonstrated in previously conducted efficacy studies in poor urban areas of Jakarta and rural Sukabumi, West Java [17, 18]. Whereas data on hemoglobin concentration were collected from children and women as part of the monitoring and evaluation of the SUM program, the way the program was conducted with blanket coverage among IDPs in a district and gradual inclusion of districts, with worse-off and more-isolated districts joining later, and simultaneous implementation of numerous other food, health, and hygiene interventions, makes it difficult to assess the impact on anemia and other health outcomes from the monitoring and evaluation data. However, a CRDNF/NIHRD/SEAMEO-TROPMED-RCCN-UI/UNICEF* survey in Aceh in September 2005 [19] documented a coverage of *Vitalita* Sprinkles of 49.9% among IDP children aged 6 to 59 months and 7.9% among non-IDP children, and found that IDP children who received *Vitalita* Sprinkles had a 25% lower risk of anemia (odds ratio, 0.75; 95% confidence interval, 0.57 to 0.98) compared with IDP children who had not received Sprinkles. The reported

prevalence of anemia was 52.2% among IDP children (and 49.8% among non-IDP children), very similar to the results obtained by Helen Keller International (unpublished observations). A 40% lower prevalence of diarrhea was also found among the children who had received *Vitalita* Sprinkles, but according to the report the difference disappeared in multivariate analysis [19]. However, the multivariate analysis may have been over-controlled, because it also included other morbidity.

The lower coverage reported by the CRDNF/NIHRD/SEAMEO/UNICEF survey as compared with the monitoring and evaluation data of the SUM program may be due to sampling differences. The SUM program aimed to cover all IDPs in the affected areas of 15 districts, and hence its monitoring and evaluation data collection was restricted to those areas. The survey instead covered all districts and hence also included IDPs from districts where the SUM program started later (September 2005) as well as IDPs who had moved away from affected areas and were hence not covered by the SUM program. In addition, the survey data may reflect compliance instead of just receipt, resulting in a finding of lower coverage.

Although the proportion of mothers or caretakers who reported that their children consumed *Vitalita* Sprinkles in the preceding month was high, it could have been higher, because availability at the household level was not a constraint. The main reason given by mothers who had not provided *Vitalita* Sprinkles to their children in the month preceding an interview was that the children did not like it. This is somewhat surprising, because *Vitalita* Sprinkles are a tasteless powder that can be added to any food, provided that it is not a liquid (because the iron source, encapsulated ferrous fumarate, does not dissolve or disperse) and that the food is not so hot as to melt the lipid layer that protects the iron from interacting with the food (i.e., it cannot be added to the food until some time after cooking). The latter two very specific instructions on the use of Sprinkles (do not use in liquids or hot food) need to be given very carefully and explicitly before their first use. Anecdotal experience with a partner organization that had not put as much emphasis on relaying these two instructions suggested that acceptance of the product was markedly lower among their target population, because mothers considered the product to be not suitable for their children.

The limited familiarity with the product highlights a very important issue for any government or agency considering distribution of multimicronutrient powder for home fortification in emergency and transition programming: the product is completely new to most populations. Its introduction, therefore, is labor-intensive and needs to be well planned. First, packaging needs to be developed that is culturally appropriate and clear and self-explanatory with regard to content, target group, and methods and frequency of use.

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Second, very clear IEC materials and a social marketing campaign need to be designed, and adequate training given to those who will provide the product. Third, and most important, the first time that a mother or caretaker receives the product, explicit instructions on its proper use should be given, which requires a relatively orderly distribution situation, to increase the chance of acceptance.

In order to implement the statement of WHO/UNICEF/WFP on providing vitamins and minerals to control micronutrient deficiencies among vulnerable groups as part of emergency relief and transition programming, suitable product(s) are required, such product(s) should ideally be available at short notice, and the distribution requirements should be such that the product(s) can be distributed under the wide range of conditions prevailing after an emergency. First, before implementing the statement, the need for the extra vitamins and minerals for the specified target groups of the population receiving a particular food basket should be assessed. If the need is confirmed, a suitable vitamin and mineral preparation should be identified and its distribution planned.

The lessons learned from the distribution of Vitalita Sprinkles in Aceh and Nias show that a new product can be distributed successfully, provided adequate attention and resources are prioritized for this. In order to quickly start such a distribution, the premix should ideally be available in the region (taking shelf-life into consideration), and generic packaging as well as information and training materials that only require translation should be developed in advance.

Conclusions and lessons learned

The experience with the provision of Vitalita Sprinkles in Aceh and Nias, Indonesia, as part of tsunami relief programming shows that providing vitamins and minerals to control micronutrient deficiencies among vulnerable groups as part of emergency relief

and transition programming, as recommended by WHO/UNICEF/WFP, is feasible, contributes to reducing micronutrient deficiencies and their consequences, and has provided good lessons learned. First, because the product and its concept of home fortification are new to the population and because there are some important messages regarding their use, adequate information materials, training, and instructions need to be prepared, and appropriate attention should be given to their first introduction to each beneficiary. Second, in order to be able to start distribution of a multimicronutrient powder for home fortification shortly after an emergency and where it has been identified to be appropriate, the product, including packaging and accompanying information and social marketing materials (or their generic version), needs to be available in advance.

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