Indian Journal of Nutrition



Volume 6, Issue 1 - 2019 © Wong E, et al. 2019 www.opensciencepublications.com

'Nutrition for Children' Program for Slum Communities in Bangalore, India

Research Article

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Article Information: Submission: 31/12/2018; Accepted: 30/01/2019; Published: 04/02/2019

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Abstract

Malnutrition is a major threat to the health status of Indian children residing in slum communities. Malnutrition being a contributor and consequence of poor immunity, adversely impacts children's physical and cognitive development. To address the high incidence of stunting and wasting among children in Bangalore, India, a feasibility and pilot study on a nutrition intervention was implemented in 2013 by Singapore International Foundation volunteers in partnership with Parikrma Humanity Foundation (PHF). This explored the needs, perceptions and suggestions of all beneficiaries associated with PHF children, which assisted in developing a full-scale 'Nutrition for Children' program. Positive outcomes from the pilot study led to the continued implementation of the program from 2014-2017. The current study provided an overview of the program's evaluation gathered from PHF parents, teachers, principals and Community Development Service (CDS) officers. Their positive responses emphasized the usefulness of this intervention. Results revealed that all stakeholders including parents strongly agreed on acquiring new nutritional knowledge and skills (89%), applying these (77%) and increasing their confidence in making positive changes (86%). Additionally, parents also noted improvements to their health (82%) and their family's (94%) alongside reduced medical expenses (84%). Positive quotes from these beneficiaries reinforced their continual support and commitment to the program. In efforts to mitigate malnutrition in Bangalore, this school-based nutrition education program was a valuable medium in imparting knowledge and skills to various stakeholders.

Keywords: India; Caregivers; Health promotion; Malnutrition; Nutrition knowledge; Program evaluation; Schoolchildren; Slums

Abbreviations

CDS: Community Develop Service; HKI: Helen Keller International; ICDS: Integrated Child Development Scheme; MDMS: Midday Meal Scheme; NHFS: National Family Health Survey; PHF: Parikrma Humanity Foundation; SIF: Singapore International Foundation; SIVs: Singapore International Volunteers

Introduction

Malnutrition in slum communities

Malnutrition, specifically undernutrition, prevails as a global health concern in developing countries, with the sub-Saharan Africa and South Asia having the highest prevalence [1]. Malnutrition is the result of a multitude of factors, among which socioeconomic status and health literacy stand as two major determinants [1-3]. South Asia scored the lowest and second lowest in these determinants,

respectively. With 35% of its population residing in slums, these communities are at a social and health disadvantage as they have limited accessibility to healthcare, education and municipal services [4]. As described by Unger [4], slums are the outcome of unplanned, disproportionate growth in urban areas coupled with inadequately supported governance. Despite urbanization in developing countries, disparities exist between non-slum and slum dwellers. The latter have an increased risk of both communicable and non-communicable diseases due to poor water irrigation, sanitation facilities, housing infrastructure and population density [4,5]. Poor hygiene practices and malnutrition further elevate their risk of contracting an illness or infection and slows recuperation [4]. These consequently result in malnutrition by affecting the individual's appetite, nutrient absorption and nutrient loss from the body [6].

Nutrition education for children

Slum communities often experience food insecurity, which

comprises of both limited availability and accessibility to food in terms of quality and quantity [7]. In light of these concerns, it is wellunderstood that nutrition interventions have the capacity to improve the health status of these communities. Hence, nutrition education is necessary to assist these communities in working around their restricted living condition, so as to create healthier living standards amidst poverty [7]. Mothers and children are most vulnerable to health problems due to their elevated nutrient need, and malnutrition could possibly hinder their physical and cognitive health [3,8]. Bhutta, et al. expressed that the phase between childhood and adolescence has garnered interest as an 'entry point' to raise awareness on the health needs due to the relatively young marital age [9]. Actions are likely to stem from the knowledge gained and potentially transform into health preferences later in life [10].

Nutrition education programs in Asia

There is a scarcity in the number of nutrition education programs that have been trialed in Asian countries. A large-scale intervention implemented by Helen Keller International (HKI) continues to address malnutrition through a comprehensive homestead food production model in impoverished areas of Bangladesh, Nepal, Philippines and Cambodia [6]. This cost-efficient approach encourages home-gardening and animal husbandry alongside providing nutrition education on food choices. Talukder, et al. identified that micronutrient deficiencies are one of the contributing factors to malnutrition [6]. Hence, diet diversification was proposed as an economically feasible solution to improve communities' nutritional status, which proved effective. Reports from their existing intervention demonstrated promising decreases in the prevalence of stunted children, improved micronutrient status, enhanced diet diversity and increased fruit, vegetable and animal product consumption in Bangladesh, Nepal, Philippines and Cambodia. Furthermore, additional strategies such as food fortification, supplementation and intensive nutrition education were encouraged to mitigate malnutrition [6].

Malnourished children in Indian communities

India is home to the largest proportion of malnourished children in South Asia, amounting to approximately 61 million, with the majority of them living in urban slums [3]. In this rapidly urbanizing country, slum communities are expanding and most of these slum dwellers get trapped in the vicious cycle of poverty which further complicates malnutrition and their poor living standards [4]. Over a period of time, continued nutritional inadequacy can result in stunting, wasting, underweight or mortality in children [2]. The National Family Health Survey conducted in Karnataka in 2015-2016 reported that approximately 30% of children under five years of age were stunted, wasted or underweight [11]. Similarly, a feasibility and pilot study conducted in Parikrma Humanity Foundation's (PHF) four schools in Bangalore noted that 38.1% of children aged 5-17 years belonging to 69 slum communities were undernourished as these children were primarily underweight, stunted or severely stunted [12]. They were likely to be deficient in vitamins A and D, iodine, iron and zinc, alongside protein and energy. This may indicate a pattern of nutritional inadequacy in the early years of life.

Nutrition education targeting caregivers of children

Educational attainment is often an indicator of health literacy and only 23% and 32% of women and men in Karnataka, respectively, completed \geq 12 years of schooling [11]. Recognizing that women's education is highly associated with the family's nutritional status, there is a pressing need to target these women to ameliorate childhood malnutrition [3,4]. This may involve women empowerment, ensuring adequate dietary intake, food fortification at a household level, diet diversification, enforcing good hygiene and sanitation practices, and increasing risk perception of ailments [3,6].

Government initiatives to combat malnutrition

Currently, there are a few cost-effective community-based initiatives implemented to address the high malnutrition rates in India. The Integrated Child Development Scheme (ICDS) offers nutrition and health support including supplementary food, growth tracking, health check-ups, immunizations, antenatal and postnatal care, and preschool education provided by trained staff at Anganwadi centres [13]. Community awareness of the availability of these services appeared to be lacking and the latter two services were least utilized by the Bangalore community [11]. Other challenges include: insufficient funding, interstate differences in needs, inadequate staff training, and poor infrastructure [13]. The Midday Meal Scheme (MDMS) provides primary level students in government-aided schools with freshly cooked hot meals to improve their nutritionall status. However, these meals were energy-focused and nutritionally incomplete in vitamins, minerals and protein [14].

'Nutrition for Children' program in Parikrma schools

Despite many studies emphasizing the need for nutrition education, there is very little information gathered on the effectiveness of school nutrition program for slum communities in India. Since the Indian school curriculum does not place much emphasis on health education or the practical application of health-related knowledge (often perceived as a medical professional's role) [10], the school may be an ideal setting to effectively deliver health messages and examine relevant topics in addressing malnutrition for children. Thus, a feasibility and pilot study was first developed and conducted in 2013 at four schools of PHF. Parents, schools' food caterers, Community Development Service (CDS) officers, teachers and principals were educated on: nutrition and child growth, implications of eating well, child's nutrient needs, food literacy (making healthier food choices, cooking techniques, food preparation and storage, food hygiene and safety) and home remedies for common ailments. The outline of the feasibility and pilot program has been published elsewhere [12]. In partnership with the Singapore International Foundation (SIF), this was delivered by a team consisting of Singapore International Volunteers (SIVs), nutritionists and dietitians. Due to the positive feedback this feasibility and pilot study received, the 'Nutrition for Children' intervention was developed, implemented and evaluated from 2014-2017 in the four PHF schools of Bangalore. This study aimed to evaluate the three-year program to assess the program's effectiveness and gain insights on the challenges, barriers, motivators, suggestions and future recommended programs to support the health status of malnourished children.

Materials and Methods

The 'Nutrition for Children' intervention was a community-based nutrition education program conducted between 2014 and 2017 targeting parents, CDS officers and teachers at PHF in Bangalore, India. This two-week program was carried out biannually over the span of three years, in accordance with the principles detailed in the Declaration of Helsinki. Verbal and written informed consent was sought from participants prior to program commencement. The majority of the respondents were parents who have their children enrolled at a local PHF school and reside in the slum neighborhood surrounding the school districts. At the end of the program, all participants were given an Aloe Vera plant, a reusable plastic container to make enzyme cleaners, a clean towel and a nail clipper (Supplementary file 1). These incentives aimed to reinforce messages relayed throughout the program and encourage positive behavioral changes.

A healthy cooking competition and clean home contest were designed, implemented and evaluated at the end of the threeyear program to assess if knowledge was effectively translated into practical skills and healthy behaviors among parents residing within the slum communities. CDS officers and SIVs used a judging checklist (Supplementary files 2 and 3) to select the top three participants at each PHF school for both contests; trophies and prizes were awarded. The top three winning recipes from the healthy cooking competitions at each PHF school were compiled into a book titled "100 Rupees a Day: Eat Healthy, Live Healthy", published and distributed to all the parents and caregivers who participated in the program (Supplementary file 4). Convenience sampling was utilized to invite school teachers, principals, CDS officers and parents to evaluate the program using rating surveys, semi-structured questionnaires and focus group discussions administered through face-to-face interviews. In addition to these, post-program reports and feedback were completed annually by SIV team leaders to improve program delivery.

Survey

A survey was designed on a 5-point Likert scale - fully disagree (n = 1), disagree (n = 2), neutral (n = 3), agree (n = 4) and fully agree (n = 5) to evaluate the program's effectiveness in propagating positive health behaviors, skills and attitudes (Supplementary file 5). Respondents were instructed to select the most applicable statement that corresponded to their perspective on their current health knowledge, skills, attitudes and practices.

Semi-structured questionnaire and focus group discussion

A semi-structured questionnaire (Supplementary file 6) was devised to investigate program outcomes, analyze skill development and identify areas of significant changes to their lives. Meanwhile, a focus group discussion through a semi-structured interview schedule (Supplementary file 7) was conducted to gather feedback and suggestions for improvement from parents, principals, teachers and CDS officers. Each segment lasted for approximately 60 minutes and valuable insights, opinions and observations were shared during the discussions. These sessions were video-recorded, transcribed adverbatim by a PHF program organizer and translated from Kannada to English within two weeks of interviewing. Transcribed data was de-identified, collated and coded to form common themes.

Results

Demographic characteristics

A total of 116 parents, 6 CDS officers and 8 teachers affiliated with the four schools of PHF from 2014 to 2017 responded to the program evaluation. Parents were the key target group and they were all females aged 22 to 27 years old (SD 5 years) who spoke Kannada, received no formal education, were of low socioeconomic status and resided in slums within a two-kilometer radius of the four PHF schools.

Survey

Data pooled from the surveys were tabulated and represented in tables to quantitatively summarize participants' opinions on the above statements (Table 1). Most of the participants felt that the workshop inculcated new knowledge and skills (parents: 99.1%; CDS officers: 100%; teachers: 100%). This knowledge was effectively translated into behaviors by most participants (n = 128; 98.5%). The information shared empowered 99.2% (n = 129) of the participants with the confidence to make positive behavioral changes. There were mixed responses on the extent to which the information taught during the program reduced medical expenses for the families, with 7% (n = 9) of participants not agreeing with this statement. However, all respondents revealed that they witnessed improvements to theirs and their family's health when they made positive changes in their lifestyles. Among which, 96.1% (n = 124) of the participants stated that they have shared the knowledge and skills learnt with neighbors and friends.

Semi-structured questionnaire and focus group discussion

Verbal inputs from semi-structured questionnaires and focus group discussions were categorized and presented in two main themes comprising of two sub-themes. Direct quotes were extracted to substantiate findings for the themes reported below.

1. Program Impact

- i) Changes to health literacy, skills, behavior and attitudes
- ii) Perceived health benefits
- 2. Program Sustainability
- i) Community advocacy and support
- ii) Motivators, barriers and suggestions

Program Impact

i) Changes to health literacy, skills, behavior and attitudes: Parents and teachers commented that useful program components in enhancing their knowledge and skills were: food hygiene practices (n = 59), nutritious meal planning (n = 47), cost effectiveness of enzyme cleansers (n = 39) and home remedies (n = 39). A PHF principal (Jayanagar) revealed that the PHF community largely comprised of high meat consumers with a preconception that "meat provides the main source of energy and nutrients" (R53). Upon learning that fruits and vegetables contain an abundance of nutrients themselves,

 Table 1: Quantitative data evaluating changes after the program.

	Parents (n = 116)	CDS officers (n = 6)	Teachers (n = 8)
Acquired new know	ledge and skills		
Fully agree	103 (88.8%)	5 (83.3%)	5 (62.5%)
Agree	12 (10.3%)	1 (16.7%)	3 (37.5%)
Neutral	0	0	0
Disagree	0	0	0
Fully disagree	1 (0.9%)	0	0
Applied gained know	wledge and skills		
Fully agree	89 (76.7%)	5 (83.3%)	6 (75%)
Agree	25 (21.6%)	1 (16.7%)	2 (25%)
Neutral	2 (1.7%)	0	0
Disagree	0	0	0
Fully disagree	0	0	0
Improvements to ov	vn health		
Fully agree	94 (81.7%)	1 (16.7%)	6 (75%)
Agree	21 (18.3%)	5 (83.3%)	2 (25%)
Neutral	0	0	0
Disagree	0	0	0
Fully disagree	0	0	0
Increased confidence	ce		
Fully agree	100 (86.2%)	4 (66.7%)	8 (100%)
Agree	15 (12.9%)	2 (33.3%)	0
Neutral	1 (0.9%)	0	0
Disagree	0	0	0
Fully disagree	0	0	0
Reduced expense on pharmaceutical drugs			
Fully agree	97 (84.3%)	2 (33.3%)	3 (37.5%)
Agree	11 (9.6%)	4 (66.7%)	3 (37.5%)
Neutral	4 (3.5%)	0	1 (12.5%)
Disagree	2 (1.7%)	0	0
Fully disagree	1 (0.9%)	0	1 (12.5%)
Improvements and benefits to family's health			
Fully agree	108 (93.9%)	4 (66.7%)	3 (37.5%)
Agree	7 (6.1%)	2 (33.3%)	5 (62.5%)
Neutral	0	0	0
Disagree	0	0	0
Fully disagree	0	0	0
Shared knowledge a	and skills gained w	vith others	
Fully agree	98 (85.2%)	4 (66.7%)	5 (62.5%)
Agree	14 (12.2%)	1 (16.7%)	2 (25%)
Neutral	3 (2.6%)	1 (16.7%)	1 (12.5%)
Disagree	0	0	0
Fully disagree	0	0	0
Data expressed as frequency (n) and valid percentage (%)			

CDS, community development service

parents readily added more fruits and vegetables into their meals. PHF teachers observed that the program has reduced plate wastage in school and unnecessary unhealthy food consumption among families. Other positive behaviors observed among families include: the retrieval of maximal nutrients from food i.e. avoid overcooking, cut vegetables into larger pieces, inclusion of more varieties and types of vegetables, and the use of Moringa in cooking; adoption of proper food storage and hygiene practices i.e. 8-step hand washing technique and trimming fingernails. Parents of Koramangala and Jayanagar schools incorporated sprouted grains and multigrain sources in their meals as well.

"Cooking used to be seen as just a chore but we now know that the finer details at each step matter" (R49), referring to the importance of every step beginning from hygienic food preparation to maximizing nutrients when cooking and safe food storage.

CDS officers revealed that parents displayed readiness to learn and demonstrated immense enthusiasm in attending the workshops, going to the extent of rescheduling their errands: "I did not expect so many participants to turn up...." (R3). Parents readily shared information learnt from workshops with their children; allowing them to gain an appreciation and liking for vegetables. Ultimately, CDS officers and PHF teachers felt that the workshop inculcated the importance of nutrition considerations in meal-planning, and positive role-modelling by parents greatly influenced their children's mindset towards healthy eating as well.

ii) Perceived health benefits: Parents reported high levels of satisfaction with tips learnt and this was attributable to the home remedies. They shared that they have implemented these remedies for common ailments which resulted in fewer visits to the doctor. PHF program organizers felt that sharing tips on home remedies was cost-efficient and convenient for the community: "Most of the times, it is a challenge for these families to get money to go to the doctor and home remedies provide immediate solutions" (R55). Over the three-year period, CDS officers noted a drastic improvement in the children's immunity, as reflected through a reduction in the incidence and severity of cold, flu and cough: "Before the program, 75-80% of our children fell sick but this dropped to 60% after one year of program implementation" (R1).

Program Sustainability

i) Community advocacy and support: The PHF founder supported the provision of Aloe Vera plant, clean towel, container, and nail clipper given as incentives to reinforce these healthy lifestyle habits: "participants were delighted when they went home with tools that encouraged continuity of the program" (R56). In addition, post-program initiatives were carried out by 100 PHF mothers at each school. They formed a support group and gathered four times a month to reinforce nutritional knowledge, healthy cooking tips and strategize ways to enhance health status within their local vicinities using available support and resources from the schools. "This workshop is like a plant. I am not going to let it stop at this stage; I am going to give each leaf to others and let the goodness spread throughout the community" (R43). Parents have further suggested gaining incremental income by making, marketing and selling homemade enzyme cleansers and healthy food products within their community: "they started promoting healthy eating by selling soya nuggets and sprouted salad to the community" (R2). Moreover, PHF teachers worked on improving the health curriculum to inculcate the importance of good nutrition to children. Meanwhile, CDS officers acted as community advocates for promoting and encouraging healthy reinforcement through regular evaluations. A PHF principal shared: "I am glad to be a bridge between the organizers and participants, to ensure that positive changes happen for the Parikrma community ... "

(R54). CDS officers described that this program has created a ripple effect by spreading awareness to more people and with this amplified impact, the program attained exceptional reach beyond the targeted beneficiaries.

(ii) Motivators, barriers and suggestions: CDS officers expressed that major program motivators that influenced healthy eating practices among communities were related to the high recognition and regards for foreign-trained and qualified nutritionists as compared to their local staff: "SIF volunteers were knowledgeable and passionate about creating an impact within the community, which also served as a driver for participants to get involved" (R4). Engagement of various modalities (i.e. hands-on activities, demonstrations, question and answer sessions, and interactive PowerPoint slides) to impart information enhanced participants' learning experience and helped them retain the nutrition knowledge and skills. PHF founder complimented SIVs in "designing a program that is culturally sensitive and well-catered to their socioeconomic status and literacy level" (R56) as well as "showing them how to stretch every rupee to enhance their health status" (R58). PHF program organizer observed that the entrepreneurial mindset and readiness to learn among parents made them view food through a whole different lens: "Food is not only of decorative value to taste good on the tongue, it is something that sustains life - that message came across very strongly" (R55).

The nutritionists felt that language was the main barrier as healthrelated messages may have been skewed or misinterpreted during the translation process and also caused unforeseen schedule delays. Their feedback stated that the evaluation process took 1.5 to 2 hours. Focus group discussions with beneficiaries and caregivers revealed various future recommendations: 1) Parents demonstrated interest in learning about nutrition and beauty and requested to have the workshop implemented on a larger scale to benefit the community unaffiliated with PHF; 2) CDS officers suggested that "it will be more rewarding if the program is taught at the slums instead of parents coming to the Parikrma venue" (R3); 3) PHF principal expressed interest in getting SIF's support in training other government teachers alongside PHF teachers to incorporate nutrition within their school's health curriculum; 4) PHF teachers felt that school children should be actively engaged in interactive health activities through skits and dances to sustain food safety and healthy eating practices.

Discussion

High rates of stunting, wasting and underweight among PHF school children have contended the need to impart nutrition education to all stakeholders of these school children to ameliorate malnutrition as documented in a feasibility and pilot study published elsewhere [12]. These study findings examined the evaluation of the three-year 'Nutrition for Children' intervention through mixed method research performed on key stakeholders of these school children.

Quantitative results demonstrated that all parents, CDS officers and teachers fully agree or agree that they acquired new knowledge and skills from the workshops, increased confidence to make better health choices, and shared these knowledge and skills with their neighbors and friends. Quotes from the qualitative data revealed that qualified, well-informed and passionate SIVs acted as prime motivators for their pursuit in the enhancement of their learning experience. Systematic review summarizing the findings from 41 studies discussed that information delivery by nutrition experts was needed to ensure fidelity of nutrition education programs [15]. Moreover, programs that enforced understanding of nutrition knowledge together with application of skills using a multicomponent model (i.e. multiple beneficiaries), and targeted nutrition at multiple avenues (i.e. schools and homes) have ensured sustainable behavior change [15]. In this study, the program has also targeted various stakeholders in different settings which provided multiple channels for health advocacy within a supportive learning environment. Health education inculcated through these mediums has demonstrated sustainable impact on the health status of these school children as reflected in: improvement to stakeholder's health; reduction in medical expenses; and improvements and benefits to family's health.

Involving parents as nutritional gatekeepers and positive rolemodelling by them, along with teachers and CDS officers were key influential factors in propagating positive behavior change within the community [10,12]. Their authoritative roles can continue to be exploited in conveying health messages to school children. Formation of a support group by the parents coupled by various comments and observations made by teachers, principals and CDS officers all played a synergistic role in conveying and imparting health messages to the school children. The move towards community health advocacy has been driven by two major economical motivators that sustained their healthy habits: 1) after actively applying hygienic practices at home, nutritious meal preparation and natural home remedies, there was a reduction in medical expenses and incidence of illnesses among family members; 2) homemade enzyme cleansers and healthier budget-friendly ingredients reduced their overall household expenses while also motivating their entrepreneurial enthusiasm to earn additional income to sustain their livelihood.

In summary, this nutrition intervention program has displayed social, economic and physical impacts i.e. development of healthy eating habits and hygienic practices, nutritious cost-effective cooking practices and improved health status for families. Parents act as direct positive role models for the PHF school children and the program has spurred their interest in sustaining the impact achieved i.e. entrepreneurship initiatives from sale of enzyme cleansers and healthy foods; development of support groups and strong community advocacy for healthy eating. Working together with all key stakeholders is highly desirable in ameliorating nutrition deficiency and eradicating malnutrition among school children.

Conclusion

Overall, these findings suggested that the three-year 'Nutrition for Children' program has improved stakeholders' knowledge, skills, behaviors and attitudes towards health practices among slum communities residing in Bangalore. Economic benefits and motivators, supportive key stakeholders' concerted efforts, qualified nutritionists and a program well-catered to the community's demographics were prime drivers for the program's success and sustainability. Removal of program barriers and implementing recommendations and concerns from key stakeholders appeared to

be challenging given the limited financial resources and manpower. Government policy makers and local companies with corporate social responsibility initiatives may consider developing cost-effective solutions together to replicate similar nutritional programs within community settings to support healthy growth and development among school children.

Funding

This research was funded by Singapore International Foundation under the specialist volunteer project grant (project code 303-IN-015-WS-001).

Acknowledgments

The authors would like to acknowledge all parents, caterers, teaching staff, community development service officers and the founder at all four schools of Parikrma Humanity Foundation for their participation, kind support and collaboration with the Singapore International Foundation volunteers from Red Element Health International Pte. Ltd.

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