
ORIGINAL RESEARCH

Positive Deviant Intervention Prevents Acute Malnutrition in Younger Siblings of Undernourished Children in Migori County, Kenya

Calvince Otieno Anino^{1}, Gertrude Mercy Were² & Jennifer Wanjiku Khamasi²*

¹Department of Environmental Health, University of Kabianga, Kenya

²Department of Family and Consumer Sciences, University of Eldoret, Kenya

²Dedan Kimathi University of Technology, Kenya

*Corresponding author Email: calvinceanino@yahoo.com

ABSTRACT: Positive Deviance (PD) Hearth program is designed to reverse Moderate Acute Malnutrition (MAM) and prevent Severe Acute Malnutrition (SAM) in children below five years. The aim of the present study was to establish the degree to which PD Hearth prevents malnutrition among the younger siblings of children in the program and to identify the role of the PD Hearth program on improving local capacity and community participation and empowerment on nutrition interventions. PD Hearth program was designed in Migori County to reverse MAM and prevent SAM in undernourished children. Younger siblings of 60 children in the program were identified through single stage cluster sampling to evaluate the nutrition outcome six (6) months after the Hearth sessions. A pipeline quasi-experimental design and mixed methods were used to collect data and perform statistical analyses. Anthropometric measurements (height and weight) for the younger siblings of the children in the program were taken; chiefs and the CHWs were also interviewed using a pretest questionnaire. Younger siblings aged 0-6 months and 6-12 months had high nutrition indicators (above -1 score) for mean Weight-for-Height (WAZ), Height-for-Age (HAZ) and Weight-for-Height (WHZ). Also, siblings in the age categories, 12-24 had high Z-scores (greater than -1 score) in WHZ and WAZ but not HAZ (-2.14±0.04). The PD Hearth program had positive influence on the home and health care practices by mothers and health workers respectively. The caregivers also noted that involvement of the local leaders contributed to the success of the PD Hearth program.

Key words: Positive, deviance, Hearth, program, malnutrition

INTRODUCTION

Malnutrition is a common problem in childhood [1]. Across the globe, 125 million children are underweight and 195 million children are stunted due to inadequate nutrition care [2]. The consequences of childhood malnutrition are adverse including increased morbidity and mortality. Acute malnutrition causes a third of the disease burden for the world's under-five year old children each year and is attributed to 3.5 million mortality cases annually [1,3]. A moderately underweight child has four times higher risks of dying of respiratory infections and malaria and five times higher risks of dying of diarrhea than a child with normal weight [1]. This is because the resulting effects of childhood malnutrition include weakened immune functioning [1]. This increases susceptibility to infection amongst the under-five year old children [4]. The most notable infections following the weakened immune system include the respiratory and gastro intestinal infections which lead to increased child mortality [1]. Prolonged child underweight leads to behavior problems and poor school achievement [5].

Improvement in children diet and caregiver behaviors promotes recovery from malnutrition [1]. A home and neighborhood-based nutrition program, Positive Deviance (PD) Hearth program, is a suitable program for improving caregiver practices and diets for children who are at risk for protein-energy malnutrition [6]. The program uses the 'Positive Deviance' approach to point out best care practices used by mothers of well-

nourished children from poor families and transfers such positive practices to caregivers in the same community with malnourished children. In Migori County PD Hearth program was designed to reverse MAM and prevent SAM in malnourished children. Caregivers of children in the program learnt on the best practices used by mothers in their neighborhood to ensure normal nutrition in their children. A resource guide indicated that the lessons learnt from the positive deviant mothers have influence in the nutrition outcome of other children in the family [6]. The CORE Group further indicated that PD Hearth program motivates health workers and contributes to community participation in nutrition program. The objective of this study was to establish the degree to which PD Hearth prevented malnutrition among the younger siblings of children aged 0-59 months in the program and to identify the role of the PD Hearth program on improving local capacity and community participation and empowerment on nutrition interventions.

METHODS

Research Design

Positive Deviance Hearth program was designed to reverse Moderate Acute Malnutrition (MAM) and prevent Severe Acute Malnutrition (SAM) in children below five years in Migori County from October 2012 to October 2013. Community Health Workers used single stage cluster sampling to identify 60 positive deviant mothers with well-nourished children and 60 negative deviant mothers with malnourished children in five (5) communities; Maroo, Nyakune, Thimlich, Kegonga and Ntimaru. The negative deviant mothers, 12 mothers in each of the five (5) communities, were brought together in a Hearth set up to prepare a PD meal for their malnourished children. The PD meal was prepared based on the best care practices identified from the positive deviant mothers. All the younger siblings aged 0-59 months of the children in the PD Hearth program were identified and studied.

Procedures for Data Collection

This study was carried out as a nutrition assessment to collect anthropometric data; height and weight of the younger siblings of children in the PD Hearth program implemented from October 2012 to October 2013 (six months after exit of Hearth sessions). Weight measurements were taken using the UNICEF approved SECA 150.0 kg scale (SECA, model 8811021659, Germany). This scale was used across the five communities to take the children's weight. The measurements were recorded close to the nearest 0.1 kg. The researcher calibrated the SECA scale to 0.00 using 1 kg of known weight after every 5 measurements to enhance precision and accuracy of the measurements [7]. Height and length were measured to the nearest 1.0 cm using height boards for children who could stand. The same board placed on a flat ground was used to measure recumbent length of children who could not "stand up tall" to the nearest 1 cm.

Weight measurements were taken using Center for Disease Control (CDC) approved procedures [8]. The participants were asked to wear light clothing and remove shoes. They were then asked to stand at center of the UNICEF approved SECA scale platform facing the researcher with hands at the sides and looking straight ahead [8]. After the participants were correctly positioned and the readout on the digital SECA scale became stable researcher read and noted weight measurements of each participant. Each participant was weighed three times and the average calculated and recorded.

Height and length measurements were taken using CDC approved procedures [8]. The participants were requested to remove shoes. They were asked to stand with heels together, arms to the side, legs straight and shoulder relaxed. Heels, buttocks, scapulae (shoulder blades) and back of the head was against the board. The participants head was then aligned in the Frankfort horizontal plane. This was done by gently tilting the head of the participants up or down to achieve the proper alignment. Also, the participants were instructed to look straight ahead to ensure that the head was on the Frankfort plane. Next, the headboard was lowered with enough pressure to compress the hair so that it rested firmly onto the highest point of the participant's head [8]. Just before the measurement was taken, the participants were requested to inhale deeply, hold the breath and keep an erect posture "stand up tall". Keeping the eye level with the hardboard, the researcher read the height measurements. Height measurement for each participant was taken three times and the average calculated. Length measurement of children who were not able to "stand up tall" was also taken. The enlisted steps for

height measurements were followed with the exception that through the help of research assistant the child was laid flat on board with hand on knees to keep legs straight. The feet of the child were flat against foot piece and the research assistants' hands cupped over the ears to ensure head is against base of board.

Face to face interviews were conducted with the 10 CHWs in the five study communities, two CHWs were attached to each PD Hearth program in the five (5) communities. The interviews helped the researcher to establish the CHWs local capacity to rally for resources and their ability to implement PD Hearth programs. Similar interviews were conducted with the area chiefs in each of the five communities, one area chief per community, to find out their commitment and its contribution to PD Hearth program outcomes. All the caregivers of the children in the PD Hearth program were interviewed on two variables, improved local capacity and community participation and empowerment.

Data Analysis

The collected data was subjected to statistical analysis using WHO Anthro 2005 Software and SAS 9.1 for Windows 2003. WHO Anthro 2005 computer program was used to determine the Z Score values from the anthropometric data. Univariate analysis procedure was performed for the younger siblings of children in the program and Mean WHZ, WAZ and HAZ were used to tell the siblings nutrition status at current status.

Ethical Approval

A research permit from the National Commission for Science, Technology and Innovation (NACOSTI) was granted in order to carry out this study. Research approvals from the Office of the County Commissioner and County Education Director in Migori were also granted. Letters of intent explaining the reason for carrying out the research were sent to both Macalder and Kehancha Sub-County Hospitals. The caregivers, Community Health Workers and the area chiefs provided their written informed consent before participating in the study, and the anonymity of the caregivers was preserved throughout the study.

RESULTS

Younger Siblings

Majority (75%) of the younger siblings of the children in the program were female and the rest were male (25%). The mean age was 18.82 ± 0.45 . Their nutrition indicators, WAZ, HAZ and WHZ were computed across the age categories, by gender and community. Table 1 shows the 3 nutrition indicators across four age categories. Children aged 0-6 months and 6-12 months had high nutrition indicators (above -1 score) for mean WAZ, HAZ and WHZ. These children were normal and not at risk of the three forms of malnutrition, underweight, stunting and wasting. Also, children in the age categories, 12-24 and 36-48 had high Z-scores (greater than -1 score) in WHZ and WAZ, thus, normal for acute malnutrition. However, they had -2.14 ± 0.04 and -1.23 ± 0.42 scores for HAZ, hence, they suffered from moderate and mild chronic malnutrition. Older children (46-60 months) were normal for wasting but had mild underweight and stunting. Therefore, the scores for nutrition indicators were better for younger siblings than their older counterparts.

Table 1- Nutrition indicators for younger siblings

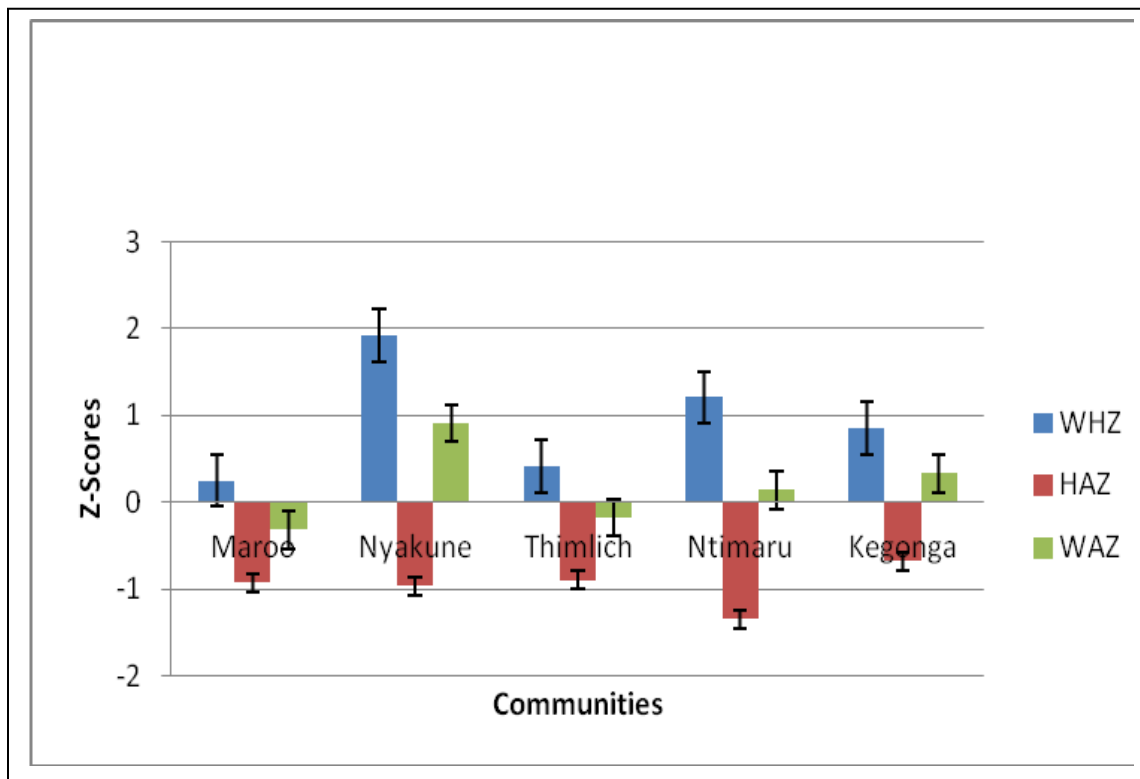
Variables/age in months	0-6 Months	6-12 Months	12-24 Months	36-48 Months	48-60 Months
Age (Mean±SE)	3.792±0.93	8.09±0.47	12.67±0.29	40.66±0.71	56.21±0
Weight	7.24±0.79	8.85±0.34	8.5±0.29	13.86±0.42	14.9±0
Height	60.84±2.80	67.15±0.61	69.25±0.43	93.67±1.86	101±0
WHZ (Mean±SE)	1.86±0.44	1.54±0.45	0.64±0.25	0.15±0.33	-0.45±0
HAZ (Mean±SE)	-0.074±0.49	-0.89±0.17	-2.14±0.04	-1.23±0.42	-1.38±0
WAZ (Mean±SE)	1.32±0.15	0.67±0.31	-0.56±0.22	-0.59±0.24	-1.16±0

With reference to gender, female siblings had normal nutrition status for all the three forms of malnutrition. Equally, their male counterparts, had strong scores for WAZ and WHZ, but not HAZ (-1.12±0.43), thus, they had mild stunting as shown in table 2.

Table 2- Nutrition Indicators for Siblings by gender

Variable/Gender	Z-Scores
Female	
Age (Mean±SE)	19.11±3.40
WHZ (Mean±SE)	0.85±0.23
HAZ (Mean±SE)	-0.97±0.17
WAZ (Mean±SE)	0.11±0.18
Male	
Age (Mean±SE)	17.93±5.52
WHZ (Mean±SE)	1.55±0.74
HAZ (Mean±SE)	-1.12±0.43
WAZ (Mean±SE)	0.51±0.60

Siblings in all the five communities had Z-scores greater than -0.35 for 2 of the 3 nutrition indicators, WAZ and WHZ, thus, normal for acute malnutrition as shown in Figure 1. However, for chronic malnutrition, siblings were poorly ranked with Ntimaru community recording the least mean HAZ.



Improved Local Capacity

Pertaining to improved local capacity, all caregivers at the time of study stated that the CHWs had the ability to implement PD Hearth programs with equal graduation rate, an improvement from 11.3% prior to the beginning of the PD Hearth programs. All caregivers also perceived that the CHWs were able to supervise the implementation of the PD Hearth programs. At the start of the Hearth program, no caregiver perceived that the CHWs were able to motivate them to participate in PD Hearth programs, however, six (6) months after Hearth

sessions they all believed on the ability of the CHWs. In addition, all the caregivers, at the time of study, believed that the CHWs were able to advocate for community resources better, identify Maternal Infant and Young Child Nutrition Practices (MIYCN), best practices to conduct Positive Deviance Inquiry (PDI) and also identify malnourished children. Thus, the PD Hearth program did not only influence behavior change in the caregivers, but also among the implementing CHWs. Community Health Workers interviewed also confirmed these findings. They pointed out that while implementing PD Hearth programs most of their skills were enhanced. All the CHWs expressed their increased understanding of child health issues, food preparation and understanding of good nutrition practices. They all stated that they were better able to counsel mothers after implementing PD Hearth programs. Accordingly, all the CHWs interviewed believed that it is possible for poor families to have well-nourished children.

They all indicated that family economy played a significant role in rehabilitation of malnourished children. Though all caregivers believed that CHWs could implement PD Hearth program on their own, most CHWs (70%) said they couldn't handle problems that might arise, and neither did they have the confidence in themselves. A number of the CHWs (70%) noted that there was a stronger link between them and the community leaders than before and that they were willing to advocate for material support for future health and nutrition interventions. The most notable local capacity building occurred among the Nyakune CHWs. They all stated that the key to improving nutritional status is changing the mothers' behaviors, and not just providing food as was with the previous nutrition programs. The nutritionist in Nyatike District further indicated that by working directly with the community, they learnt more about nutritional value of food through menu planning, and more about existing community practices. The Maroo and Nyakune CHWs also stated that they learned more concept of PD Hearth and were motivated to implement more nutrition programs. This is a clear indication that PD Hearth program improves capacity of the CHWs.

Community Participation and Empowerment

The caregivers pointed out that community participation was one of the PD Hearth program successes. In all the five communities visited the community leaders were aware of the PD Hearth, and were able to explain what happens during the PD Hearth sessions. Community leaders interviewed in Nyakune and Maroo locations revealed that they received PD Hearth reports from the CHWs on the numbers of malnourished children and progress of the PD Hearth program. Indeed, the caregivers also attested to the leaders empowered ability since they would tell the consequences of malnutrition, including lowered education performance, retarded growth and increased morbidity and mortality.

When the community leaders articulated and understood the consequences of malnutrition there was a substantial support from the individuals in the community and the individual leaders. For instance, in Ntimaru location, the village chief donated 12 kg of maize to each PD Hearth session, whereas 4 community members donated groceries. Local government did not support the PD Hearth programs financially but community leaders and health officers oriented the families. Some leaders paid regular visits to the hearths and their commitments were more pronounced during PD Hearth graduation. In fact, leaders in Nyakune, Maroo and Ntimaru communities mentioned that they were happy to be engaged in the health community programs, a verbal commitment that community leaders, through the PD Hearth program have taken a sense of responsibility to improve the status of malnourished children in their community.

DISCUSSION

Younger siblings of the children in the program in all the communities had normal nutrition status for underweight and wasting, but not stunting which is an indication that PD Hearth program better rehabilitated acute malnutrition than chronic malnutrition. Caregivers for the children in the program used the care practices, knowledge and skills they learnt in the program to make better lives of their children [9]. Younger siblings had good nutrition scores because they had the ability to attain 'catch up growth' unlike their older counterparts in the program. Female younger siblings had normal nutrition status for all the three forms of malnutrition; wasting, stunting and underweight. This could be an indication that female children responded faster to PD Hearth program than the male children [10].

The outstanding feature of PD Hearth program is its multifold purposes: rehabilitation of underweight in children; sustenance of rehabilitation; prevention of acute malnutrition in younger siblings and promotion of behavior change in caregivers and CHWs [10-14]. It increased CHWs understanding of child health issues, food preparation and good nutrition practices. It also improved the ability of the CHWs to counsel mothers after implementing PD Hearth programs. Positive Deviance Hearth further created a stronger link between the CHWs and the community leaders, thus, enhancing their influence to advocate for material support for future nutrition programs [15]. The strengthened link was important for the success of the PD Hearth programs considering that Community Health Workers are the ‘eyes’ and the ‘ears’ of the health facilities in every community when it comes to implementing health programs [15]. It was established that community leaders in the five communities were materially committed to the implementation of the PD Hearth program. Communities with committed leaders prevented malnutrition in the younger siblings of the children in the program. They influenced a number of activities in the community, including the receptiveness of the community to PD Hearth program [16]. In addition, community leader’s participation in nutrition interventions was key to the success of the PD Hearth program intended to alleviate malnutrition [2]. Thus, at the basic cause of malnutrition, UNICEF pointed out political and ideological superstructures which community leaders are part [2].

CONCLUSION

Although PD Hearth intervention is implemented to rehabilitate malnutrition in undernourished children, it has a spillover effect in younger siblings of children in the program. The PD Hearth program prevents acute malnutrition in younger siblings of the children in the program. The PD Hearth program also built the local capacity of the CHWs and promotes community participation and empowerment. The policy makers need to integrate the Hearth community model structure in nutrition education programs to prevent malnutrition in siblings of malnourished children.

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COMPETING INTEREST

The authors declare that they have no competing interest

AUTHORS CONTRIBUTIONS

COA collected the data, designed and conducted the statistical analyses and interpreted the results. GMW and JWK supervised the study; acquisition of data and statistical analyses. All authors contributed to the writing of the paper. All authors read and approved the final script.

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