

Effect of Positive Deviance Hearth Intervention on Acute Malnutrition Persistence among Children under Five in Burera District, Rwanda

Gaston Minani^{1*}, Michael Habtu¹, Erigene Rutayisire¹

¹Department of Public Health, School of Health Sciences, Mount Kenya University, Kigali, Rwanda

*Corresponding author: Gaston Minani. Department of Public Health, School of Health Sciences, Mount Kenya University, Kigali, Rwanda. Email: minanigaston@gmail.com

Abstract

Background

Positive Deviance Hearth is considered as a good approach to use existing and available resources to address malnutrition at the community level.

Objective

The present study aimed to determine the effect of Positive Deviance Hearth on persistent acute malnutrition management among children under five in Burera District.

Methods

A comparative quasi-experimental study was conducted in Burera district. One hundred ninety six (196) participants were selected purposively. Nutrition status of children who attended Positive Deviance Hearth sessions for 12 consecutive days were measured and compared with children who were not in the HEARTH intervention.

Results

The majority (55.6%) of children in both groups were male. The prevalence acute malnutrition persistence was significantly higher (52.0%) among the non-HEARTH intervention compared to those in the HEARTH intervention area (20.4%). In reduced model of the multivariate analysis, persistence of acute malnutrition was 87% higher among children in the non-Hearth intervention compared to those in Hearth intervention (AoR= 0.13; 95%CI: [0.05-0.35], $p < 0.001$).

Conclusion

The use of Positive Deviance Hearth model was significantly associated with low prevalence of malnutrition persistence; therefore, it should be adopted by the Ministry of Health.

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Keywords: Positive Deviance Hearth, acute malnutrition persistence, children under five

Introduction

Globally in 2020, the number of under five years children who suffered from stunting was 149 million.[1] Despite remarkable economic growth during the past two decades, the number of undernourished children in Rwanda remains stubbornly high. Rwanda Demographic Health Survey (RDHS-2020) showed that 33% of

children aged 6 to 59 months are stunted. The highest prevalence of stunting in Rwanda was found in Northern Province with 41%. [2] Rwanda involved massive infusions of supplemental food, nutritional education program at village level or at health centre attempt at addressing malnutrition problems simultaneously and massively. In addition to being costly and intrusive, these approaches are generally not sustainable

because supplemental food received by families with malnourished children is from external resources. It was observed that when outside resources are withdrawn, which always happened eventually, villages inevitably spiralled back into their original condition. To respond to the mentioned issue, the government of Rwanda and its Development Partners initiated an effective and sustainable model called “Positive Deviance” which does not, however, impose a nutritional solution, [3] Besides the improvement of Nutritional status, PD also tackles the issues impeding the improvement of hygiene, Health, Parenting education, early learning and school readiness and Child Protection. Positive deviance is regarded as an approach that can lead to sustainable rehabilitation for malnourished children and improve the holistic early Childhood development.[4]

Positive deviance (PD) is an approach to behavioural and social change based on the observation that in any community there are people whose uncommon but successful behaviours or strategies enable them to find better solutions to a problem than their peers, despite facing similar challenges and having no extra resources or knowledge than their peers. These individuals are referred to as positive deviants. Researchers observed that despite the poverty in a community, some poor families had well-nourished children. Some suggested using information gathered from these outliers to plan nutrition programs.[4, 5]

Positive deviance /Hearth Nutrition Program is a home-based and neighbourhood-based nutrition program for children who are at risk for protein-energy malnutrition in developing countries. The program uses the “positive deviance” approach to identify those behaviours practiced by the mothers or caretakers of well-nourished children from poor families and to transfer such positive practices to others in the community with malnourished children.[6]

Several countries have successfully reduced stunting over a short period using positive deviance Hearth Interventions, including Peru, Thailand, Brazil and Vietnam.

In just 8 years from 2008 to 2016 Peru cut its stunting rate from 28% to 13%; Thailand reduced it from 25% in 1987 to about 10% in 2016; between 1974 and 2007, Brazil reduced the prevalence of stunting in children under five years of age from 37.1% to 7.1%; Vietnam cut child stunting by nearly 50% in a decade.[7]

Positive Deviance Hearth (PDH) has been used to reduce stunting in Cambodia where it played a crucial role to fight against the undernutrition at the community level [8]. In Uganda a PDH played a role to reduce malnutrition where it was found to be a solution to 68% of 4501, who were cured and discharged.[9]

A PDH intervention conducted in Zambia showed that 89% of the study participants gained significant weightiness at 12 days and this was hundred percent at 30 days as well as at 3 months .[10] A similar study carried out in Burundi also showed that 87% of the participants gained greater than 200 g in 12 days and 84 of these children maintained weight at 1-month follow-up. Necessary weightiness increase in PDH has been defined as 200 g in 12 days, greater than or equal to 400 g within 30 days and greater than or equal 900 g within 3 months.[11] In Rwanda, little is known about the effect of PD in reduction of malnutrition; there is no study that has investigated the effectiveness of PDH in the country. Therefore, this study aimed to assess the effect of positive deviance Hearth Intervention in rehabilitation of malnourished children.

Methods

Study design

A quasi-experimental study design was used to determine the effect of PDH in rehabilitation of malnourished under five year old children in Burera district. The study was conducted in communities of Burera district in February 2022. PDH approach is a new approach in Rwanda to rehabilitate malnourished children. This intervention was applied in Burera district for treating children under five years of age, with Moderate Acute Malnutrition.

PDH approach is done during 24 consecutive days where 12 days are done at site (a venue selected by parents) and others 12 sessions at home as follow-up to ensure the skills learn during PD are applied at home. The parents/caretakers bring the food for preparing a balanced diet, everyone bring what she/he has for example one bring potatoes, beans, small fish, firewood and positive deviant mothers supervise the activity and train mother with malnourished children how to cook using locally available food.

Study population and sample size

All the families in PDH intervention programme were included in the study. The inclusion criteria for the PDH were children aged 6-59 months who completed all PDH sessions.

One hundred ninety six (196) children were selected purposively among the children in intervention area and non-intervention area. Ninety eight (98) in intervention and 98 in control groups. All the children in the intervention group attended 12 days of PDH sessions and were followed up for 12 consecutive days at their homes. Malnourished children in non-PDH intervention group were rehabilitated with other approaches.

Data collection instrument and procedure

A survey questionnaire was designed for mothers/caregivers of children under the study in the two Sectors namely Gitovu and Rugengabari. Data included socio-demographic and economic characteristics, and skills of parents on PDH approach, and benefits of attending PDH. The questionnaire was directed to parents/Caretakers of all children in the study. The outcome/dependent variable was Acute Malnutrition Persistence. The data collection was conducted in the month of February 2022. Nutrition assessment was performed to collect the nutrition anthropometric measurements and forms were administered to parents/caretakers of the children in the PDH and non-PDH intervention. The anthropometric measurements of the children on the PDH intervention and control group were taken.

Data analysis

After their collection, data were entered into the computer and analyzed with SPSS 21 software. Descriptive statistics were used to determine the persistence of malnourishment among children under the age of five in PDH intervention and non-intervention areas. Logistic regression analysis was applied to establish the factors associated with persistence of acute malnutrition among children PDH and non-intervention areas. The findings of the study were considered significant at p-value <0.05. Tables and Figures were used to present the findings of the study.

Ethical considerations

The researcher obtained ethical clearance from Mount Kenya University Rwanda Ethical review board. The permission to collect data was also obtained from Burera District. In addition, participants were requested their voluntary participation in this research. Prior to data collection, every study participant signed a consent form. The respondent's identity was kept confidential by not recording names on the questionnaire. In addition, the participants were informed that there was no risk of refusing to participate or withdrawing at any time during the interview.

Results

Socio-demographic characteristics of respondents in the Hearth and non-Hearth intervention

Overall about one third (33.2%) of the mother/caregivers of the children under the study were aged between 25 and 29 years followed by those aged 35 years and above (30.1%). Regarding to the relationship of the child to caregiver, majority (87.2%) were their biological mothers. Most of the mothers/caregivers (78.6%) had primary level of education, while 65.3% were in the social category one and two. Overall the proportion indicates that there were more male children (55.6%) than girls. The majority (79.6%) were breastfed immediately after birth, and these comprised 94.9% in the control group and 64.3% in the PDH intervention group

The exclusive breast-feeding was highly common among intervention and non-intervention group. Birth spacing was assessed, and overall the majority (82.7%) had a period of at least 24 months; which was 88.8% in the non-PDH intervention group and 76.5% in the PDH intervention group (Table 1).

Table 1. Socio-demographic characteristics of respondents in the hearth and non-hearth intervention

Variables	Heart intervention		Non-Heart intervention		Total		p value
	n	%	n	%	n	%	
Age of caregiver (year)							
19-24	14	14.3	16	16.3	30	15.3	0.944
25-29	34	34.7	31	31.6	65	33.2	
30-34	20	20.4	22	22.4	42	21.4	
35 and above	30	30.6	29	29.6	59	30.1	
Relationship of caregiver to the child							
Father	22	22.4	0	0.0	22	11.2	<0.001
Mother	76	77.6	95	96.9	171	87.2	
Grandmother	0	0.0	3	3.1	3	1.5	
Level of education of the caregiver							
Non educated	15	15.3	19	19.4	34	17.3	0.548
Primary education	80	81.6	74	75.5	154	78.6	
Secondary	3	3.1	5	5.1	8	4.1	
Social category							
One or two	70	71.4	58	59.2	128	65.3	0.072
Three four	28	28.6	40	40.8	68	34.7	
Gender of the child							
Male	54	55.1	55	56.1	109	55.6	0.886
Female	44	44.9	43	43.9	87	44.4	
Duration of breastfeeding after birth							
Immediately	63	64.3	93	94.9	156	79.6	<0.001
> 1 hour	35	35.7	5	5.1	40	20.4	
Exclusive breastfeeding for 6 months							
Yes	92	93.9	95	96.9	187	95.4	0.306
No	6	6.1	3	3.1	9	4.6	
Yes	87	88.8	89	90.8	176	89.8	0.637
No	11	11.2	9	9.2	20	10.2	
Birth spacing							
≥24 months	75	76.5	87	88.8	162	82.7	0.024
<24 months	23	23.5	11	11.2	34	17.3	

Prevalence of persistent acute malnutrition in the HEARTH intervention and Non-HEARTH intervention

The results demonstrate that the proportion of children with MUAC less than 12.5mm were significantly more in the non- PDH area (44.9%) compared to those in the PDH intervention area (17.3%) with p value of <0.001.

The Z score of less than minus two was also higher in the non-PDH area compared to the intervention group where there were no children with Z score less than minus three (p value<0.001). The prevalence of acute malnutrition persistence was 20.4% among the PDH intervention group compared to 52.0% in the non- PDH intervention group and this difference was statistically significant (p value<0.001) (Table 2).

Table 2. Prevalence of acute malnutrition persistence in the Hearth intervention and Non-Hearth intervention

Variables	Hearth intervention		Non-Hearth intervention		Total		p value
	n	%	n	%	n	%	
MUAC							
<12.5	17	17.3	44	44.9	61	31.1	<0.001
> or equal 12.5	81	82.7	54	55.1	135	68.9	
Z score for weight-for-height							
< -2 Z -Score	20	20.4	48	49.0	68	34.7	<0.001
<-3 Z -Score	0	0.0	3	3.1	3	1.5	
>2 Z-Score	78	79.6	47	48.0	125	63.8	
Persistence of acute malnutrition							
Yes	20	20.4	51	52.0	71	36.2	<0.001
No	78	79.6	47	48.0	125	63.8	

Effect of positive deviance Hearth intervention on persistent acute malnutrition

We observed that after adjustment for potential confounders, acute malnutrition persistence was 0.13 times likely in the PDH intervention group than in the non-PDH intervention group (AOR=0.13; 95%CI=0.05-0.35; p<0.001). Children belonging to social category one or two were 0.36 times likely to have persistent acute malnutrition than those in social category three (AOR=0.36; 95%CI=0.16-0.79; p=0.011).

Persistent acute malnutrition was 0.20 times likely among children who breastfed immediately after birth compared to those who started after one hour (AOR=0.20; 95%CI=0.06-0.72; p =0.014). Children with exclusive breast-feeding for 6 months compared to those who did not have, were 0.18 fold likely to have persistent acute malnutrition (AOR=0.18; 95%CI=0.03-0.96; p =0.045) (Table 3).

Table 3. Effect of positive deviance hearth intervention on persistent acute malnutrition

Variables	Persistent acute malnutrition				COR, 95%CI	p value	AOR, 95%CI	p value
	Yes		No					
	n	%	n	%				
Area/site								
Hearth	20	20.4	78	79.6	0.24(0.13-0.44)	<0.001	0.13(0.05-0.35)	<0.001
Non-Heart	51	52	47	48	Ref		Ref	
Age of caregiver (year)								
19-24	11	36.7	19	63.3	0.68(0.28-1.69)	0.413		
25-29	23	35.4	42	64.6	0.65(0.32-1.34)	0.24		
30-34	10	23.8	32	76.2	0.37(0.15-1.26)	0.26		
35 and above	27	45.8	32	54.2	Ref			
Level of education of the caregiver								
Non educated	13	38.2	21	61.8	1.03(0.21-5.06)	0.969		
Primary education	55	35.7	99	64.3	0.93(0.21-4.02)	0.918		
Secondary	3	37.5	5	62.5	Ref			
Social category								
One or two	40	31.3	88	68.8	0.54(0.29-0.99)	0.048	0.36(0.16-0.79)	0.011
Three or four	31	45.6	37	54.4	Ref		Ref	
Gender of the child								
Male	35	32.1	74	67.9	0.67(0.37-1.24)	0.181		
Female	36	41.4	51	58.6	Ref			
Duration of breastfeeding after birth								
Immediately	52	33.3	104	66.7	0.55(0.27-1.12)	0.099	0.20(0.06-0.72)	0.014
> 1 hour	19	47.5	21	52.5	Ref		Ref	
Exclusive breastfeeding for 6 months								
Yes	64	34.2	123	65.8	0.15(0.03-0.74)	0.02	0.18(0.03-0.96)	0.045
No	7	77.8	2	22.2	Ref		Ref	
Weather continued breastfeeding for 12-23 months								
Yes	64	36.4	112	63.6	1.06(0.40-2.80)	0.904		
No	7	35	13	65	Ref			
Spacing								
<24 months	63	38.9	99	61.1	2.07(0.88-4.85)	0.095	1.46(0.54-3.91)	0.457
>24 months	8	23.5	26	76.5	Ref		Ref	

AOR = Adjusted Odds Ratio; COR = Crude Odds Ratio; CI = Confidence Interval

Discussion

A substantial reduction of mortality rate in children has been observed in developing countries; this achievement is partly due to successful nutritional interventions programs. However, the extent to which these programs have contributed to the long-term restoration of normal growth and development has remained unclear. The objective of this study was therefore, to determine the effect of PDH intervention on acute malnourishment persistence among children less than five in Burera District.

The proportion of children with MUAC less than 12.5mm were significantly more among the non-PDH area (44.9%) compared to those in the PDH intervention area (17.3%). The Z score of less than minus two was also higher in the non-PDH area compared to the intervention group where there were no children with Z score less than minus three (p value < 0.001). The present findings are in line with the study conducted in Zambia where among 132 undernourished children who participated in PDH sessions led by volunteers, 75 children (58%) were cured and discharged after twelve days.[12] The present study also agrees with the study conducted in Vietnam where malnutrition decreased from 47% to 13% in PDH intervention group compared to non-PDH intervention 48% to 46%.[4] Similar results were reported in the study conducted in Pakistan where with PDH, a significant improvement from 2.8 to 1.8 W/A Z-Score was observed among children in PDH Intervention group.[13]

The result from the present study revealed that the likelihood of acute malnutrition persistence in the PDH intervention group was 0.13 times than in the Non-PDH intervention group (AOR=0.13; 95%CI=0.05-0.35; p < 0.001). In other words, persistent acute malnutrition was 87% times less likely in the PDH intervention area than in the Non-HEARTH site. The PDH impact in Malawi showed the reduction of malnutrition where WAL and WAZ were 0.85 and 0.75 for undernourished children for a period of 12 days.[14]

A quasi-experimental study done in Ecuador reported the increase of 0.17 in Weight for Age compared to the control group.[15] The present study was similar to that conducted in Haiti where the malnutrition reduced from 26% to 6% after PDH.[4]

Unexpectedly, we found that children belonging to social category (Ubudehe) one or two were 67% more likely to be cured during acute malnutrition rehabilitation intervention than those in social category three (AOR=0.36; 95%CI=0.16-0.79; p =0.011). This may due to the nutritional support including milk, and shishakibondo from the government to malnourished children from families in ubudehe category one and two are receiving.[16]

Persistent acute malnutrition was 80% among children who did not breastfeed immediately after birth. Children with exclusive breastfeeding for 6 months were 0.18 fold likely to have persistent acute malnutrition. It is well known that poor breastfeeding is one of the responsible factors that contribute to child malnutrition. [17] Singh et al. reported that nutritional status of malnourished children who had been exclusively breastfed improve quicker than those who did not exclusively breastfed. [18]

Based on the findings from the current study, it is evident that with the use of available and accessible foodstuff, child stunting can be reduced even eradicated in Rwanda. The main causes of stunting include but are not limited to: poor access to energy-rich, nutritious food, lack of availability of energy-rich, nutritious-rich foods, lack of knowledge on how to prepare nutritious foods for children, children lacking energy, prone to illness, slow to heal and lacking appetite, children growing slowly or poorly, harmful cultural practices, myths and food taboos.[19,20] Once families/caregivers are fully aware of these causes and how to deal with them, stunting should be eradicated. It was proven that positive deviance is based on the premise that some solutions to

community problems are already within the community and just need to be discovered. [5] Most public health experts agree that the solutions discovered within a community are more sustainable than those brought into the community from outside.[6,8] Positive Deviance is an internationally proven community-based model for rehabilitating malnourished children in their own homes with involvement of the whole community (Community leaders, volunteers e.g. CHWs, health staff) and development partners.[6]

Based on the remarkable success on acute malnutrition reduction using PDH approach observed in some districts where it was implemented, once integrated in multi-sectoral interventions, PDH can provide a positive impact in reduction of stunting and improvement of a holistic early childhood development in Rwanda.

Conclusion

PDH approach has shown a significance reduction of acute malnutrition within 12 days. The prevalence of acute malnutrition persistence was lower among the children in PDH intervention. PDH has changed the lives of children who had been destined for acute malnutrition. It was found that mothers could have well-nourished children if they initiated breast feeding soon after birth, exclusively breast-fed until six months of age, and then introduce nutrient dense foods. It was clear that certain household practices, such as giving a child his/her own plate, not withholding food to punish a child, hand washing (before meals, before food preparation, after changing nappies of after toilet) and using toilets rather open fields, all helped mothers to raise well-nourished children. It was found out that with available resources, malnutrition should be eradicated. Scaling-up the use of PDH intervention in rehabilitation of malnutrition should be adopted by the government of Rwanda.

Authors' contribution

GM, MH, ER, contributed to the conception, development of the manuscript and working on reviewer' comment until it publication.

Conflict of interest

No conflict of interest declared

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References

1. Vassilakou T. Childhood Malnutrition: Time for Action. *Children*. 2021;8(2):103.
2. National Institute of Statistics of Rwanda: Rwanda Demographic and Health Survey 2019-20. *NISR*. <https://www.statistics.gov.rw/publication/demographic-and-health-survey-20192020-key-indicators>
3. Odette A, Kamanzi U, Rwanda Integrated approach as a strategic support to reduce stunting. eposters. 2016. *Project EKN*. CRS <https://www.eposters.net/pdfs/ekn-project-director.pdf>
4. Wollinka O, Burkhalter K. E., and Bahir N. (Eds), *Hearth Nutrition Model: Applications in Haiti, Vietnam and Bangladesh; Arlington, VA: BASICS, 1997*
5. Lino J, and Ruiz G.. The power of positive mothers in children's health in Crises: Community, National and International responses. *Global Future (A world Vision J. for Humana Development) 2007*. via https://www.wvi.org/sites/default/files/GF07-1_web.pdf
6. CORE Group. Nutrition Working Group, Child Survival Collaborations and Resources Group (CORE), Positive Deviance / Hearth: A Resource Guide for Sustainably Rehabilitating Malnourished Children, Washington, D.C: December 2002. <https://coregroup.org/wp-content/uploads/2017/09/Positive-Deviance-Hearth-Resource-Guide.pdf>

7. Ashi K. K, Aneesa A. , Edith K.. Success stories with reducing stunting: Lessons for PNG. *World Bank Group*. 2019
8. Baxter, R., Taylor, N., Kellar, I., & Lawton R. What methods are used to apply positive deviance within healthcare organisations? A systematic review. *BMJ Qual Saf*. 2016;25:190–201.
9. Sciences M, February H, Series SL, Sector P, Paper L. Strides for Family Health Legacy Series: Strengthening Health Services with Private Sector Support in Uganda. 2015; https://pdf.usaid.gov/pdf_docs/PA00KBXM.pdf
10. People in Need. Positive Deviance for Nutrition. 2019;1–16. Available from: https://resources.peopleinneed.net/documents/712-positive-deviance-for-nutrition_people-in-need_october-2019.pdf
11. Inamahoro C, Kiguli J, Makumbi FE, Wamuyu-Maina G, Wamani H. Nutritional Recovery Outcome among Moderately Malnourished Under-five Children in Communities Implementing Positive Deviance - Hearth or Community Health Workers' Nutrition Promotion Approaches in Karusi and Kirundo Provinces, Burundi. *J Sci Sustain Dev*. 2017;6.
12. Harris J, Haddad L , Grütz SS. Turning Rapid Growth into Meaningful Growth: Sustaining the Commitment to Nutrition in Zambia, Brighton: IDS 2014; Available from: <https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/4463/Zambia%20Special%20Collection%20full%20version.pdf>
13. Nishat, N., & Batool, I.. “Effect of ‘Positive Hearth Deviance’ on Feeding Practices and Underweight Prevalence among Children Aged 6-24 Months in Quetta District, Pakistan: A Comparative Cross Sectional Study. *Sri Lanka Journal of Child Health*, 2011,40(2).”
14. Seetha, Anitha et al.. “How Immediate and Significant Is the Outcome of Training on Diversified Diets, Hygiene and Food Safety? An Effort to Mitigate Child Undernutrition in Rural Malawi.” *Public Health Nutrition*. 2018, 1156–66.
15. Roche ML. A community-based positive deviance/hearth intervention to improve infant and young child nutrition in the Ecuadorian Andes. *McGill University (Canada)*. 2011.
16. The Ministry of Health (MoH). National Protocol for the Management of Acute Malnutrition. 2018 , <https://www.unicef.org/rwanda/media/141/file/2018-SAM-Protocol-English.pdf>
17. Mwangome, M., Murunga, S., Kahindi, J., Gwiyo, P., Mwasho, G., Talbert, A., Kiige, L., Samburu, B., Mturi, N., Abubakar, A., Jones, C., & Berkley, J. A.. Individualized breastfeeding support for acutely ill, malnourished infants under 6 months old. *Maternal & child nutrition*. 2020,16(1), e12868. <https://doi.org/10.1111/mcn.12868>
18. Singh, D. K. , Rai, R. , Mishra, P. C. , Maurya, M. , & Srivastava, A.. Nutritional rehabilitation of children <6 mo with severe acute malnutrition. *Indian Journal of Pediatrics*,. 2013,81, 805–807. 10.1007/s12098-013-1285-3
19. UNICEF.. UNICEF strategy for scaling up nutrition. *UNICEF publication house*. 2015
20. Dipasquale, V., Cucinotta, U., & Romano, C. . Acute Malnutrition in Children: Pathophysiology, Clinical Effects and Treatment. *Nutrients*.2020,12(8), 2413. <https://doi.org/10.3390/nu12082413>