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FUNCTIONAL CAPACITY OF COMMUNITY ANIMATION CELLS (CAC) AND ITS CONTRIBUTION IN IMPROVING NUTRITIONAL STATUS FOR CHILDREN UNDER FIVE IN BUNYAKIRI HEALTH ZONE IN SOUTH KIVU, DEMOCRATIC REPUBLIC OF CONGO

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ABSTRACT

Introduction: Malnutrition significantly contributes to high mortality rates among children under 5 in sub-Saharan Africa, with the eastern Democratic Republic of Congo (DRC) being particularly affected. In response, various strategies, including community outreach units, have been implemented to enhance child nutrition, specifically in the Bunakiri health zone of DRC's Southern Province. This study seeks to evaluate the functional capacity and the contribution of these CACs on improving the nutritional status of young children in the area. ***Methode:*** Data related to the functional capacity and the contribution of CAC in improving nutritional status of children under five were collected in a cross-sectional baseline survey conducted on a total of 280 households randomly selected in Bagana (control zone) and in Tshigoma and Bunyakiri (intervention zone). ***Results:*** The results show that Community Animation Cells (CACs) are more effective in improving child nutrition in the control zone compared to the intervention zone. Factors like household's knowledge on the breastfeeding for children aged 20 to 24 months, training of CAC members on children nutrition, Knowledge of CAC members on the nutrition of children were associated to the functional capacity of CAC facilitating them to participate in the improvement of the nutritional status of children under five in Bunyakiri health zone. ***Conclusion:*** Efforts should be made in improving training, providing necessary resources, engaging communities, and adapting interventions to improve the functional capacity of CAC and increase their contribution for the improvement of nutritional status of children under five in Bunyakiri health zone

Materials and Methods

Context of the study area: The study was conducted in the Bunyakiri health zone, located in the Kalehe area of South Kivu province, Democratic Republic of Congo. This zone is bordered to the north by the Iteberro health zone; to the south and south-east by the Miti-Murhesa health zone; to the south-west by the Kalonge health zone; to the east by the Kalehe health zone, the Bushaku and Shicha Chandjofu peaks and the Minova health zone, separated by the Bulaisa mountain range; and to the west by the Mulungu health zone. The Tshigoma health area lies to the north of the Kachiri health area, to the south of the Mushunguti health area, to the east of the Ramba health area and to the west of the Makuta health area. Bunyakiri health zone is bordered by Bitobolo health area to the north, Muoma health area to the south, Chiriba health area to the east and Chisasa Hill to the west. The selection of these health areas was based on two factors. Firstly, the Bagana health area (control) was chosen due to its effective CAC members, who have successfully improved the nutritional status of children under five through community initiatives. In contrast, the Bunyakiri and Tshigoma health areas (intervention) were chosen due to the absence of functioning CACs in these villages which has led to a decline in the nutritional status of children.

Study design: The study is of the quasi-experimental type, with three phases: baseline, intervention and endline. However, the data collected in this scientific article is based on a cross-sectional survey conducted at the start of the study in the control (Bagana health area) and intervention (Bunyakiri and Tshigoma health areas) zones. The study focused on the required standard feeding practices adopted by the CACs to achieve adequate nutritional status of children under 5 years of age. Members of the Community Animation Cells (CACs), families and households within children under five in the selected health areas constituted the target population for the data collection. The respondents included parents, family members, and other individuals responsible for the care and nutrition of young children.

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INTRODUCTION

Globally, 149 million children under the age of five were affected by stunting in 2020, while 45 million suffered from wasting. Malnutrition is a leading cause of death among children under five, responsible for 45% of these fatalities, with the majority occurring in low- and middle-income countries (WHO, 2019). Inadequate nutrition during early childhood can hinder cognitive development, learning, educational attainment, and future economic productivity (Ayalew*et al*., 2021; Yao *et al*., 2022). Conversely, adequate and proper nutrition supports optimal growth, strengthens the immune system, enhances cognitive development, and reduces the risk of infectious diseases (Yao *et al*., 2022). In sub-Saharan Africa region, malnutrition remains a critical public health challenge. The prevalence of childhood malnutrition continues to be a significant issue in developing countries (Imdad *et al*., 2011). The rates of malnutrition are particularly elevated among children aged 6 to 24 months, a period when breast milk alone no longer fulfills their nutritional requirements and supplementary foods are introduced (Shrimpton *et al*., 2001). New global nutrition targets for maternal, infant, and young children (IYC) have been set for 2030. These goals include reducing stunting by 50%, limiting wasting to less than 3%, and curbing overweight to no more than 3% among children under five. Achieving these targets will require significant support for countries (WHO, 2019). In response, the World Health Organization (WHO) advocates for the expansion of nutrition interventions both within and outside health facilities to enhance overall nutrition (WHO, 2019). One strategy to address the shortage of healthcare professionals is to delegate certain tasks to trained community members. This approach aims to broaden access to basic health services and promote healthy behaviors at the community level (Westgard *et al*., 2018). The Democratic Republic of Congo (DRC) is one of the sub-Saharan countries where the prevalence of childhood malnutrition remains high. The high rates of undernutrition among children under five contribute significantly to morbidity and mortality in the Democratic Republic of Congo (World Health Organization. In South Kivu province, and specifically within the Bunyakiri health zone, addressing this issue has become a central focus for local health initiatives and community-based interventions (Ndela*et al*., 2022). Community Animation Cells (CACs) represent a key component of these interventions, designed to mobilize local resources and engage community members in improving health outcomes. CACs operate through a participatory approach, aiming to enhance community involvement in health promotion activities, including nutritional education and support (Chumo*et al*., 2023). By leveraging local knowledge and resources, CACs seek to address the multifaceted determinants of malnutrition and improve the nutritional status of vulnerable populations, particularly children under five. Previous studies have highlighted the potential of community-based interventions in enhancing child nutrition and reducing malnutrition rates. For instance, research in similar contexts has demonstrated that community-led programs can effectively increase dietary diversity and improve the overall health of young children (Burgess *et al*., 2023). However, there is limited empirical evidence regarding the specific impact of CACs on nutritional outcomes in the Bunyakiri health zone. This study aims to fill this gap by evaluating the contribution of CACs to improving the nutritional status of children under five in Bunyakiri. Through a comprehensive analysis of CAC activities and their outcomes, we seek to understand the effectiveness of this approach and provide recommendations for enhancing community-based nutritional interventions in Bunakiri health zone.

MATERIAL AND METHODS

Study design and sampling: Data were collected in a cross-sectional baseline survey conducted in three selected villages including Tshigoma, Bunyakiri and Bagana areas. The baseline survey focused on the required standard feeding practices adopted by the CACs to achieve adequate nutritional status of children under 5 years of age. The choice of these health areas is linked to both the characteristics of the study areas and their nutritional status at community level, with Bunyakiri and Tshigoma presenting a bleak nutritional picture in line with the criteria of a village with community nutrition supported by CAC members, and the targeted villages of Bagana health area presenting community nutrition activities with advanced improvement supported by CAC's members activities at community level. In addition to this, Bunyakiri and Tshigoma are among the health areas with poor CAC performance, while Bagana is among those with good performance (OCHA, 2023). Members of the Community Animation Cells (CACs), families and households within children under five in the selected health areas constituted the target population for the data collection. The respondents included parents, family members, and other individuals responsible for the care and nutrition of young children.

The Sample size was determined using the following formula:

$$n = \frac{2(Z_{\alpha+}Z_{\beta})^2 P(1-P)}{(D)^2} * DE = 107.$$

An additional 30% was added to the sample size to account for non-response: the sample size was rounded up to 140 participants per site. A total sample of 280 households including 140 households in Bagana (control zone) and 140 households in Tshigoma and Bunyakiri (intervention zone) were randomly selected for data collection. For the CAC members, 60 individuals were randomly selected from the 12 participating villages in the study area, with 5 members chosen from each village including 30 members from the intervention area (Tshigoma and Bunyakiri) and 30 from the control area (Bagana) for this baseline study.

Data collection: Quantitative data were collected digitally using semi-structured questionnaires pre-loaded on smartphones. The KOBO Collect application was used on Android smartphones with custom-designed forms adapted from the physical data forms. Qualitative data were collected using the Key Informant Interview guide, the in-depth interview guide and the focus group interview guide. The KII guide was administered to the CAC staff, the IDI (In-depth-Interview) guide was administered to the household members and the focus group guides were used on the household members. The data were collected to assess the functional capacities of CACs and their contribution in improving nutritional status of children under five. Data related to: (1) the indicators facilitating the monitoring of the performance CACs, (2) the household knowledge on the functional capacities of CACs were collected from the selected households; (3) CAC's members training for a functional capacities of CAC, (4) the knowledge of the role and scope of CAC in improving nutritional status of children under five, (5) CAC's members knowledge on tools and work aids used for the nutrition in children under 5 years, (6) the knowledge of CAC's members on the nutrition of children under 5 years were collected from the CAC's members.

Data analysis: The collected data were subjected to the descriptive analysis. Frequencies and percentages were calculated and a chi-square test of association was performed to check the association of these variables with the dependent variable of nutritional status.

RESULTS

Household knowledge of nutritional practices for children under five and its association with the functional capacity of CACs: The results in Tables 1a and 1b indicate that the effectiveness of CACs in improving the nutritional status of children under five is associated with households' awareness that breastfeeding should continue for children aged 20 to 24 months [OR=0.1 (0.9-0.6), p=0.013], knowledge of the importance of exclusive breastfeeding for the first six months [OR=2.1 (1.1-3.7), p=0.014], and the understanding that children should eat 2 to 3 times a day [OR=2.2 (1.2-3.8), p=0.004]. Focus groups and individual interviews reveal that community members recognize the significant health benefits of breastfeeding.

Table 1a. Household knowledge of nutritional practices for children under five and its association with the functional capacity of CACs

Variable			Baseline control zone	Baseline intervention zone	Total	OR(95% IC)	P value
Number of meals a child aged between 6 and 24 months should eat per day							
Good functional capacity	Good nutritional status	*1 meal/ day*	05 (13.51)	03 (13.64)	8	1,7(0,4-7,4)	0,512
		2 meals/ day	24 (64.86)	16 (72.73)	40		
		At least 3 meals a day/Other	08 (21.62)	03 (9.09)	11		
Poor functional capacity	Poor nutritional status	*1 meal/ day*	10 (9.71)	26 (22.03)	36	1,1(0,6-2,0)	0,660
		2 meals/ day	60 (58.25)	58 (49.15)	118		
		At least 3 meals a day/Other	33(32.04)	34 (28.82)	67		
Breastfeeding children aged 20 to 24 months							
Good functional capacity	Good nutritional status	Always	03 (8.11)	08 (36.36)	11	0,1(0,0-0,6)	0,013
		Often	05 (13.51)	01 (4.55)	6		
		Very often	11 (29.73)	04 (18.8)	15		
		Not at all	18 (48.65)	09 (40.91)	27		
Poor functional capacity	Poor nutritional status	Always	19 (18.45)	37 (31.36)	56	0,4(0,2-0,9)	0,030
		Often	17 (16.50)	18 (15.25)	35		
		Very often	27 (26.21)	12 (10.17)	39		
		Not at all	40 (38.83)	51 (43.22)	91		
Food given to children aged 0 to 6 months							
Good functional capacity	Good nutritional status	Breast milk only	11 (29.73)	11 (50.0)	22	2,3(0,7-7,0)	0,165
		Breast milk with other Food	26 (70.27)	11 (50.0)	37		
Poor functional capacity	Poor nutritional status	Breast milk only	60 (58.25)	88 (74.58)	148	2,1(1,1-3,7)	0,014
		Breast milk with other Food	43 (41.75)	30 (25.42)	73		
Number of meals the child must eat per day in this household							
Good functional capacity	Good nutritional status	At least 2 meals a day	20 (54.05)	10 (45.45)	30	0,4(0,1-1,1)	0,109
		2 to 3 meals per day	12 (32.43)	12 (54.55)	24		
		More than 3 meals per Day	05 (13.51)	0 (0.0)	5		
		As required	0 (0.0)	0 (0.0)	0		
		3 meals a day with rusty Causes	0 (0.0)	0 (0.0)	0		
Poor functional capacity	Poor nutritional status	At least 2 meals a day	35 (33.98)	35 (29.66)	70	2,2(1,2-3,8)	0,004
		2 to 3 meals per day	34 (33.01)	62 (52.54)	96		
		More than 3 meals per Day	27 (26.21)	19 (16.10)	46		
		As required	06 (5.83)	01 (0.85)	7		
		3 meals a day with rusty Causes	01 (0.97)	01 (0.85)	2		

Table 1b. Household knowledge of nutritional practices for children under five and its association with the functional capacity of CACs

Variable			Baseline contrôle zone	Baseline intervention zone	Total	OR(95% IC)	P value
The age recommended for the introduction of semi-solid foods:							
Good functional capacity	Good nutritional status	2 months	04 (10.8)	0 (0.0)	4	0,00(ND*)	0,266
		Around 6 months	33(89.2)	22 (100)	55		
Poor functional capacity	Poor nutritional status	2 months	26 (25.24)	04 (10.81)	30	0,3(0,1-1,1)	0,1
		Around 6 months	77 (74.76)	33 (89.19)	110		
Connaissance des ménages d'une alimentation équilibrée							
Good functional capacity	Good nutritional status	Variety of foods from all the food groups	13 (35.14)	10 (45.45)	23	0,6(0,2-1,9)	0,581
		Foods from a single food Group	05 (13.51)	01 (4.55)	6		
		Foods rich in sugar and fat.	04 (10.81)	02 (9.09)	6		
		All types of diet	12 (32.43)	04 (18.18)	16		
		Other	03 (8.11)	05 (22.73)			
Poor functional capacity	Poor nutritional status	Variety of foods from all the food groups	62 (60.19)	65 (55.08)	127	1,2(0,7-2,1)	0,496
		Foods from a single food Group	03 (2.91)	10 (8.47)	13		
		Foods rich in sugar and fat.	06 (5.83)	07 (5.93)	13		
		All types of diet	17 (16.50)	25 (21.19)	42		
		Other	15 (14.56)	11 (9.32)	26		

**ND: Not defined*

Table 2. Training of CAC's members on the nutrition of children under five years

	Control	Intervention		
Variable	Baseline	Baseline	OR (95% IC	Sig.
	n=30(%)	**n=30(%)**		
Have received training (CAC member role)				
Non	12(40.0)	14(46.7)	0.76 (0.27-2.1)	
Yes	18(60.0)	16(53.3)		0.79
Course duration				
1-3 days	15(50.0)	15(50.0)	0.33 (0.03-3.5)	
4-7 days	3(10.0)	1(3.3)		0.60
Type of training Received				
Training on the signs of malnutrition	1(3.3)	0(0.0)		
Community Strategies	13(43.3)	9(30.0)	3.2 (0.2-0.9)	0.004
Types of food, breast-feeding children	4(13.3)	5(16.7)		
Food production, essential family Practices	0(0.0)	2(6.7)		
Trainer/support (who provided the training)				
Partners	13(43.3)	12(40.0)	0.84 (0.2-1.4)	
MOH	5(16.7)	3(10.0)		
No training Received	12(40.0)	15(50.0)		0.44
Adapting training to work as a CAC Member				
No	13(43.3)	19(63.3)	0.9 (0.2-2.9)	1

They emphasize that breastfeeding provides essential nutrients for optimal growth and development, reducing the risk of illness. One participant noted, "Breastfeeding contributes to the child's good health and growth," and it is common for mothers to breastfeed for six to seven months, as stated, "*Breastfeeding brings good health for the child, starting from birth and contributing to growth.*"

nutrition [OR=0.84 (0.2-1.4), p=0.44]. Qualitative analysis highlights the importance of CAC training in enhancing their efforts to combat child malnutrition. Training is primarily organized by non-governmental organizations, health centers, and occasionally by the Ministry of Health through the provincial health division (DPS).

Table 3. Knowledge of the tools and resources used by CAC members to support the nutrition of children under five years of age

	Control	Intervention		
Variable	Baseline	Baseline	OR (95%IC)	Sig.
A tool to assist CACs in their work	n=30(%)	n=30(%)		
Type of tools and help provided to get the job done			0,72(0,1-3,5)	
Minister's counting book	11(36.7)	15(50.0)		
Minister's counting booklet Advice card (good nutritional practice) (iii). Leaflets	1(3.3)	5(16.7)		0,999
(i) Minister's counting book (ii). Image box	2(6.7)	1(3.3)		
(i) Advice card (good nutritional practice) (ii) Key messages booklet (iii) Minister's counting booklet	3(10.0)	4(13.3)		
(i) Prevention framework (ii) Image box (iii). Leaflets	2(6.7)	0(0.0)		
Other generic tools	1(3.3)	5(16.7)		
Frequency of maintenance or Restocking				
Annual	3(10.0)	10(33.3)		
Monthly	3(10.0)	3(10.0)	1.7 (1.2-5.6)	0.41
Don't know anything	19(63.3)	15(50.0)		
Half-yearly	0(0.0)	1(3.3)		
Quarterly	5(16.7)	1(3.3)		
Knowledge of the visible signs of child malnutrition				
(1) Low energy levels and fatigue more easily than other children (2) Changes in behaviour, such as unusual irritability, slowness or anxiety.	2(6.7)	2(6.7)		
(1) Not growing or gaining weight at the expected rate (slow growth) (2) Changes in behaviour, such as unusual irritability, slowness or anxiety. (3) Oedema, (4) Low energy levels and fatigue more easily than other children	14(46.7)	14(46.7)		
Oedema	1(3.3)	1(3.3)		
(1) Oedema (2) Low energy levels and fatigue more easily than other children 2. Behavioural changes, such as unusual irritability, slowness or anxiety.	10(33.3)	9(30.0)	1,0(0,3-2,7)	0,999
(1)PB less than 125 mm (2) Oedema (3) Not growing or gaining weight at the expected rate (slowed growth)	2(6.7)	4(13.3)		
Other (please specify)	1(3.3)	0(0.0)		

Table 4. Knowledge of CAC members on the nutrition of children under 5 years

	Control	Intervention		
Variable	Baseline	Baseline	OR (95%IC)	Sig.
Knowledge of nutrition	n=30(%)	n=30(%)		
Number of times a day a child must be breastfed				
≤8 times/day	21(70.0)	13(43.3)	3.0 (1.0-8.8)	0.06
>8 times/day	9(30.0)	17(56.7)		
Continue breastfeeding even after the introduction of solid foods/complements.				
Yes, breastfeeding should continue alongside solid food until at least 2 years of age.	27(90.0)	30(100.0)	0.31 (0.0-3.1)	
Only if the baby refuses solid food	1(3.3)	0(0.0)		0.61
Only if the mother wants to continue	2(6.7)	0(0.0)		
Knowledge of a balanced diet				
A variety of foods from all the food groups in appropriate proportions.	23(76.7)	22(73.3)	1.81 (0.8-11)	
Foods from a single food group.	2(6.7)	3(10.0)		0.002
Foods rich in sugar and fat	0(0.0)	0(0.0)		
All types of food are considered balanced	5(16.7)	5(16.7)		
Number of times a day a child should eat				
Less than two meals	3(10.0)	1(3.3)	3.1 (2.4-21)	
Two to three main meals.	10(33.3)	19(63.3)		0.005
More than three times a day.	10(33.3)	10(33.3)		
According to the child's needs and appetite.	3(10.0)	0(0.0)		
Three main meals and snacks between meals	4(13.3)	0(0.0)		

Training of CAC's members on the nutrition of children under five years: **T**able 2 shows that 60% of CAC members in the control zone reported receiving training on their roles, compared to 53% in the intervention zone, but the difference was not significant [OR=0.76 (0.27-2.1), p=0.79]. Most training sessions in both zones lasted between 1 and 3 days and covered all planned topics, with no significant difference between the zones [OR=0.33 (0.03-3.5), p=0.60]. In the control zone, 43.3% of CAC members received training on community strategies to combat malnutrition, whereas only 30% in the intervention zone did, showing a significant difference [OR=3.2 (0.2-0.9), p=0.004]. Both zones reported that technical and financial partners facilitated the training, with no significant impact on CAC activities aimed at improving child

One CAC member noted, "*We received two training courses—one on combating malnutrition and another on drinking water, provided by TPO at a health center in the control zone in 2021.*"

Knowledge of the tools and resources used by CAC members to support the nutrition of children under five years of age: Table 3 reveals that tools such as the advice card on good nutritional practices, the key messages booklet, and the Minister's counting booklet were rarely by CAC members used and nearly absent in both the control and intervention zones. This finding was corroborated by statements from at least 10 CAC members in the control zone [OR=1.7 (1.2-5.6), p=0.41]. Knowledge of visible signs of malnutrition in children under five was also limited, with fewer than

50 members in both zones recognizing symptoms like poor growth, behavioral changes, edema, and low energy levels. Focus group discussions emphasized the importance of recognizing these signs, noting that *community members use observations such as thinness, fatigue, skin and hair changes, and leg swelling to assess children's nutritional status*.

Knowledge of CAC members on the nutrition of children under 5 years: In the control zone, 70% of CAC members knew that a child should be breastfed at least 8 times a day, compared with 43.3% of CAC members in the intervention zone, [OR=3.0 (1.0-8.8), p=0.06]; in the control zone, at least 76.7% of CAC members knew that a variety of foods from all food groups should be provided in appropriate proportions, whereas in the intervention zone this proportion was 73.3% of CAC members, [OR=1. 81 (0.8-11), p=0.002]; the effectiveness of functional capacities of the CACs was linked with CAC members' knowledge, the number of times, i.e., more than 3 times a day, that a child should eat, [OR=3.1 (2.4-21), p=0.005].

Knowledge of the roles and responsibilities of CAC members in relation to the nutrition of children under five years of age: Table 5 shows that in the control area, at least 20% of CAC members were aware of their roles, including: (1) forwarding information to CODEV and CODESA, (2) organizing regular meetings to monitor and evaluate community action plans, (3) mobilizing local resources for local development (e.g., maintaining water points), and (4) creating and implementing local emergency response plans. In contrast, only 13.3% of CAC members in the intervention zone were aware of these roles. Qualitative analysis also highlighted the role of CACs in combating malnutrition. Community members recognized the increasing role of CACs in local development and health improvement, noting their contribution to building trust between patients and healthcare providers.

As stated by one participant, "CAC helps us with development and agriculture," and another added, "They enable us to connect with patients and doctors." Additionally, CACs are seen as crucial in seeking health information and engaging in development activities. Despite some awareness of CACs' involvement in dispensaries and community health education in the control zone (Bagana), there are still uncertainties about their specific responsibilities and overall impact.

Knowledge of technical assistance and motivation of the CAC members on nutrition in children under 5 years: Table 5 indicates that technical support was more substantial in the control zone compared to the intervention zone. This support included covering operating costs for health zone partners, providing vegetable seeds, and supplying work equipment such as boots and briefcases. This support was noted by 3.3% of CAC members in both zones [OR=2.25 (0.8-6.3), p=0.196]. Additionally, 23.3% of CAC members in the control zone received support for income-generating activities, whereas only 3.3% in the intervention zone reported such support, which is crucial for enhancing CAC effectiveness in combating child malnutrition. Equipment, seeds, and tools were provided by technical and financial partners in both zones (46.7% in the control zone and 43.3% in the intervention zone), with no significant difference observed [OR=0.87 (0.31-2.4), p=0.999].

Cultural and traditional attitudes and perceptions of households on nutritional practices in relation to the functional effectiveness of CACs: Table 7 shows that in areas where the functional capacities of CACs were perceived as weak; 90.29% in the control zone and 88.98% in the intervention zone, the functional effectiveness of CAC on nutritional practices in improving under five child nutrition were not influenced by cultural or household [OR=1.15 (0.4-2.7), p=0.827].

Table 5. Knowledge of the roles and responsibilities of CAC members in relation to the nutrition of children under five years of age

Control		Intervention		
Variable	Baseline	Baseline		
Roles as a member of the CAC	*n=30(%)*	*n=30(%)*	*OR(IC à 95%)*	*p-value*
Other (please specify)	7(23.3)	8(26.7)		
(1) Organisation of meetings to analyse the information Collected.	1(3.3)	0(0.0)		
(1) Centralisation of data collected in the community (2) Transmission of information to CODEV and CODESA (3) Development and implementation of the community action plan and maintenance of village facilities with the participation of all key actors in the village (4) Scheduling of consultation meetings with the village/cell population	2(6.7)	5(16.7)		
(1) Scheduling consultation meetings with the village/cell population (2) Ensuring the security of the materials and equipment assigned to the villages/cells (3) Transmitting information to CODEV and CODESA (4) Centralising the data collected in the community (5) Organising meetings to analyse the information collected. (6) Feedback to the village at the general assembly 5. Develop and implement the community action plan and maintain the village facilities with the participation of all the key actors in the village. (7) Organise regular meetings to monitor and evaluate the community action plan. (8) Ensure the mobilisation of local resources to implement the local development plan (e.g. maintenance of water points) (9) Develop and implement local emergency response plans.	2(6.7)	1(3.3)		
(1) Organisation of meetings to analyse the information collected (2) Transmission of information to CODEV and CODESA (3) Development and implementation of the community action plan and maintenance of village facilities with the participation of all key actors in the village (4) Development and implementation of local emergency response plans (5) Ensuring the security of materials and equipment assigned to villages/cells (6) Scheduling of consultation meetings with the village/cell population.	5(16.7)	1(3.3)		
(1) Transmission of information to CODEV and CODESA (2). Organise regular meetings to monitor and evaluate the community action plan. (3) Ensure the mobilisation of local resources to implement the local development plan (e.g. maintenance of water points) (4) Draw up and implement local emergency response plans.	6(20.0)	4(13.3)		
(1) Ensure the mobilisation of local resources for the implementation of the local development plan (e.g. maintenance of water points) (2) Organise regular meetings to monitor and evaluate the community action plan (3) Develop and implement the community action plan and maintain village facilities with the participation of all key actors in the village.	2(6.7)	1(3.3)		
(1) Draw up and implement local emergency response plans (2) Draw up and implement the community action plan and maintain village facilities with the participation of all key actors in the village (3) Ensure the mobilisation of local resources to implement the local development plan (e.g. maintenance of water points)	4(13.3)	8(26.7)	1,6(0,4-6,4)	0,730
(1) Ensure the security of the materials and equipment assigned to the villages/cells (2) Ensure the mobilisation of local resources for the implementation of the local development plan (e.g. maintenance of water points) (3) Feedback to the village at the general meeting (4) Transmission of information to CODEV and CODESA	1(3.3)	2(6.7)		

Table 6. Knowledge of technical assistance and motivation of the CAC members on nutrition in children under 5 years

Control		Intervention		
Variable	Baseline	Baseline		
Technical assistance, motivation	*n=30(%)*	*n=30(%)*	*OR(95% IC)*	*p-value*
Support for CAC's work.				
Supporting the operating costs of partners in the health zone, supplying vegetable seeds, Providing work equipment	1(3.3)	1(3.3)	2,25(0,8-6,3)	0,196
Financial incentives for routine activities	2(6.7)	4(13.3)		
(1) Provision of certain working tools by the health zone central office (2) Provision of income-generating activities	2(6.7)	0(0.0)		
(1) Provision of income-generating activities (2) Provision of market garden seeds (3) Provision of work equipment	4(13.3)	10(33.3)		
Management tools at community level (registers, prevention plans,)	3(10.0)	3(10.0)		
Other (please specify)	18(60.0)	12(40.0)		
Type of support received by the CAC				
Operating costs	4(13.3)	10(33.3)	0 ?2(0,1-3,5)	0,999
(1) Operating costs (2) Provision of income-generating activities (3) Provision of market garden seeds	0(0.0)	2(6.7)		
Provision of income-generating activities	7(23.3)	1(3.3)		
Supply of vegetable seeds	15(50.0)	14(46.7)		
(1) Supply of market garden seeds (2) By supporting the operating costs of partners in the health zone	1(3.3)	1(3.3)		
(1) By supporting the operating costs of partners in the health zone (2) Supply of market garden seeds	3(10.0)	2(6.7)		
Support structure or body received for the CAC				
MOH,	5(16.7)	4(13.3)	0,87(0,31-2,4)	0,999
Partners	14(46.7)	13(43.3)		
FBO	1(3.3)	0(0.0)		
Other	11(36.7)	12(40.0)		

Table 7. Cultural and traditional attitudes and perceptions of households on nutritional practices in relation to the functional effectiveness of CACs in Bunyakiri Health Zone

Variable			Baseline control zone	Baseline Intervention zone	Total	OR (95% IC)	P value
Cultural/traditional beliefs about eating practices							
Good functional capacity	Good nutritional status	No	34 (91.89)	22 (100)	56	0,00(ND)	0,286
		Yes	03 (8.11)	0 (0.0)	3		
Poor functional capacity	Poor nutritional status	No	93 (90.29)	105 (88.98)	198	1,15(0,4-2,7)	0,827
		Yes	10 (9.71)	13 (11.02)	23		
The usefulness of CAC members in the fight against malnutrition							
Poor functional capacity	Good nutritional status	*No*	25 (67.57)	12 (54.55)	37	0,57(0,1-1,7)	0,405
		Yes	12 (32.43)	10 (45.45)	22		
Poor functional capacity	Poor nutritional status	*No*	53 (51.46)	54 (45.76)	107	0,79(0,4-1,3)	0,42
		Yes	50 (48.54)	64 (54.24)	114		

Table 8. Indicators for monitoring the performance of the CACs at village level in the health areas

Indicators	Zone	Target/ Performance	Expected targets February 2024	Target Achieved February 2024	%
Children 0-6 months exclusively breastfed	Intervention zone	80%	42	20	47,6
	Control zone		162	131	80.7
Children aged 20-24 months who continue to breastfeed	Intervention zone	80%	45	13	28,9
	Control zone		82	43	35,26
Children aged 6-24 months consuming an adequate complementary food (at least 3 meals a day and 4-star ration)	Intervention zone	50%	84	35	47,6
	Control zone		112	59	52.7
Children aged 6 -59 months with PB > 125 mm	Intervention zone	80%	153	80	52,3
	Control zone		113	71	62,8
Pregnant and breastfeeding women who have received a 4-star diet (frequency and variety)	Intervention zone	80%	143	26	47,6
	Control zone		161	134	83.2
Children aged 0 -59 months attending CPS	Intervention zone	80%	370	35	9,5
	Intervention zone		312	64	20,5

The perceived usefulness of CAC members in combating malnutrition did not correlate with their functional effectiveness in either zone [OR=0.57 (0.1-1.7), p=0.405]. No significant differences were found among the studied variables (p>0.05).

Indicators for monitoring the performance of the CACs at village level in the health areas: The results in Table 8 show that the level of functional capacity of the CACs was good in the control zone, whereas in the intervention zone, this functional capacity was weak in relation to the performance indicators assessed at the start of the study.

DISCUSSION

The findings of this study reveal that Community Animation Cells (CACs) demonstrate varying levels of effectiveness in improving the nutritional status of children under five, with significant differences observed between the control and intervention zones in Bunyakiri health zone where this study was conducted. Specifically, CACs in the control zone were more effective, showing a greater impact on child nutrition compared to those in the intervention zone. In terms of statistical significance, CACs' effectiveness was notably associated with specific knowledge areas. Household knowledge about continued breastfeeding for children aged 20-24 months, knowledge of exclusive breastfeeding for six months, and the importance of feeding children 2-3 times a day were significantly related to CAC functionality ($p < 0.05$). Additionally, the knowledge of appropriate feeding frequency significantly influenced CAC effectiveness ($p = 0.005$). On the other hand, several aspects, although informative, did not reach statistical significance. For instance, while there was a noticeable trend towards better breastfeeding frequency knowledge in the control zone compared to the intervention zone ($p = 0.06$), this difference was not statistically significant.

Similarly, knowledge about dietary diversity showed a non-significant difference between zones (p = 0.002), though still indicative of a trend favoring the control zone. The findings align with existing research that highlights the importance of community interventions in reducing child malnutrition. Studies by Bhutta*et al*. (2008), Bryce *et al*. (2008), and Black *et al.* (2013) have shown that community-based programs can significantly improve child nutrition when supported by regular performance reviews, training, and financial support. Similarly, Scott *et al.* (2018), Gintinge*t al*. (2023), and Elimiane*t al*. (2024) found that improved access to resources and support enhances CAC effectiveness. Jones *et al*. (2003) and Noor *et al*. (2020) also stress the importance of community education and health programs in tackling child malnutrition. The effectiveness of CACs can therefore be seen as part of a wider model in which initial inequalities are overcome through structured interventions, as supported by studies in Mozambique (Amosse*et al.,* 2023) and Uganda (Karuga*et al.,* 2023) which emphasise the need for consistent monitoring to ensure long-term success. The importance of accurate knowledge about breastfeeding and feeding practices as revealed in this study is supported by other studies such as McDonald *et al.* (2015), Nguyen *et al.* (2017), and Lassi *et al*. (2020), which highlight the role of family education in improving nutrition outcomes. The effectiveness of CACs in this regard is also supported by research by Hoddinott*et al*. (2008), Robert *et al.* (2017), Makate and Makate (2018) and Nabuuma and Ekesa (2024), which shows that well-informed households are more likely to adopt and maintain beneficial health practices.

This is consistent with the findings of Zottarelli*et al.* (2007), Black *et al.* (2013) and Shirazi *et al.* (2023), who reported that community-based education programs can lead to significant improvements in infant feeding practices, particularly when they involve multiple stakeholders and are culturally appropriate. The same results were found by Bhutta*et al.* (2008) and Prendergast and Humphrey (2014) who demonstrated that education is crucial, as education is most effective when it is regularly reinforced and tailored to the specific needs of the community. The significant association between CAC members' knowledge and their effectiveness aligns with findings by Victora*et al.* (2016), who emphasize that knowledge about feeding practices and the frequency of breastfeeding a child under five is crucial for the success of community-based nutrition programs. In Bunyakiri health zone where this study was conducted, CAC members declared that the training they received allowed them to know their roles and to know how to combat malnutrition: "…*these trainings are benefits since they highlight the roles of CAC members, we have received two training courses, the first on how to combat malnutrition and the second on drinking water in the form of community relays, as we know that community relays are also CAC members.*

Despite the positive impact observed in the control area, there were notable gaps in the intervention area. While previous studies, such as Callaghan-Koru *et al*. (2013) and Furaha *et al*. (2016), demonstrate that targeted interventions can yield significant improvements in resource-limited settings. The study reveals that these improvements were not immediately observed in the intervention zone. This discrepancy could be attributed to variations in the implementation of interventions or differences in baseline conditions between the zones. Although some signs can indicate that some children may be experiencing malnutrition, as reported by certain CAC members; The limited understanding of malnutrition signs among CAC members in both control and intervention zones, despite previous studies showing varying levels of knowledge in similar contexts (Nimpagaritse*et al*., 2019; Becquey*et al*., 2019), suggests that the effectiveness of training programs may vary based on local conditions and the quality of training provided. The results highlight the need for targeted interventions and continuous monitoring to address disparities in CAC effectiveness. To improve outcomes in future interventions would require: to (i) enhance training and to provide resource focusing on providing regular, standardized training for CAC members on key health practices, including breastfeeding, complementary feeding, and recognizing signs of malnutrition (ensure CACs have access to essential tools and resources) ; (ii) to strengthen community engagement in fostering ongoing community support and engagement for CACs to build trust and improve intervention outcomes (regular feedback and visible success stories can enhance community support and CAC effectiveness); (iii) to adaptand monitor interventions in assessing and adaptingcontinuously strategies based on feedback and performance data to address the specific needs of different zones. Regarding to that, further research should examine how different training approaches and content affect CAC performance and health outcomes, to investigate the impact of tool usage and resource availability on CAC functionality and to study the long-term impact of enhanced training and resource provision on child nutrition and overall community health.

CONCLUSION

This study finds that Community Animation Cells (CACs) are more effective in improving child nutrition in the control zone compared to the intervention zone. This difference is associated with better household knowledge of key nutritional practices, such as continued and exclusive breastfeeding, and frequent feeding. Although trends favored the control zone, they were not always statistically significant. Challenges in the intervention zone, including variations in implementation and baseline conditions, led to less effective results. Limited understanding of malnutrition signs among CAC members indicates varying training effectiveness. Future efforts should focus on improving training, providing necessary resources, engaging communities, and adapting interventions based on feedback. Further research is needed to evaluate the impact of different training approaches and resource availability on CAC performance and child nutrition.

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REFERENCES

Amosse, F., Kinshella, M.-L. W., Boene, H., Sharma, S., Nhamirre, Z., Tchavana, C., Magee, L. A., von Dadelszen, P., Sevene, E., Vidler, M., &Munguambe, K. (2023). The development and implementation of a community engagement strategy to improve maternal health in southern Mozambique. *PLOS Global Public Health*, *3*(1), e0001106. https://doi.org/10.1371/journal.pgph.0001106

Ayalew, C. A. & Belachew, T. (2021). Effect of complementary feeding behaviour change communication delivered through community-level actors on infant growth and morbidity in rural communities of West Gojjam Zone, Northwest Ethiopia: A cluster-randomized controlled trial. *Maternal&child nutrition*, *17*(3), e13136. https://doi.org/10.1111/mcn.13136

Becquey, E., Huybregts, L., Zongrone, A., Le Port, A., Leroy, J. L., Rawat, R., Touré, M., & Ruel, M. T. (2019). Impact on child acute malnutrition of integrating a preventive nutrition package into facility-based screening for acute malnutrition during well-baby consultation: A cluster-randomized controlled trial in Burkina Faso. *PLoS Medicine*, *16*(8), e1002892. https://doi.org/10.1371/journal.pmed.1002877

Bhutta, Z. A., Ahmed, T., Black, R. E., Cousens, S., Dewey, K., Giugliani, E., Haider, B. A., Kirkwood, B., Morris, S. S., Sachdev, H., & Shekar, M. (2008). What works? Interventions for maternal and child undernutrition and survival. *The Lancet*, *371*(9610), 417–440. https://doi.org/10.1016/S0140-6736(07)61693-6

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., Ezzati, M., Grantham-Mcgregor, S., Katz, J., Martorell, R., & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, *382*(9890), 427–451. https://doi.org/10.1016/S0140-6736(13)60937-X

Bryce, J., Coitinho, D., Darnton-Hill, I., Pelletier, D., &Pinstrup-Andersen, P. (2008). Maternal and child undernutrition: effective

action at national level. *The Lancet*, *371*(9611), 510–526. https://doi.org/10.1016/S0140-6736(07)61694-8

Burgess, R. A., Shittu, F., Iuliano, A., Haruna, I., Valentine, P., Bakare, A. A., ... & INSPIRING Project Consortium Ahmed Tahlil Ahmar SamyCassar Christine IsahAdamuOsebi Adams MagamaAbdullahiSeriki Ibrahim OlowookereTemitayoFolorunso McCalla Matt Uchendu ObiomaSalako Julius Bakare Damola OlojedeOmotayo. (2023). Whose knowledge counts? Involving communities in intervention and trial design using community conversations. *Trials*, *24*(1), 385.

Callaghan-Koru, J. A., Nonyane, B. A., Guenther, T., Sitrin, D., Ligowe, R., Chimbalanga, E., Zimba, E., Kachale, F., Shah, R., &Baqui, A. H. (2013). Contribution of community-based newborn health promotion to reducing inequities in healthy newborn care practices and knowledge: evidence of improvement from a three-district pilot program in Malawi. *BMC Public Health*, *13*(1), 1052. https://doi.org/10.1186/1471-2458-13-1052

Chumo, I., Kabaria, C., Oduor, C., Amondi, C., Njeri, A., &Mberu, B. (2023). Community advisory committee as a facilitator of health and wellbeing: A qualitative study in informal settlements in Nairobi, Kenya. *Frontiers in Public Health*, *10*, 1047133.

Elimian, K., Diaconu, K., Ansah, J., King, C., Dewa, O., Yennan, S., Gandi, B., Forsberg, B. C., Ihekweazu, C., &Alfvén, T. (2024). Enablers and barriers to implementing cholera interventions in Nigeria: a community–based system dynamics approach. *Health Policy and Planning*. https://doi.org/10.1093/heapol/czae067

Furaha, A., Pembe, A. B., Mpembeni, R., Axemo, P., &Darj, E. (2016). Community health workers can improve male involvement in maternal health: evidence from rural Tanzania. *Global Health Action*, *9*(1), 30064. https://doi.org/10.3402/gha.v9.30064

Ginting, R., Girsang, E., Sinaga, M., & Manalu, P. (2023). Barriers to Stunting Intervention at a Community Health Center: A Qualitative Study. *JurnalPenelitian Pendidikan IPA*, *9*(10), 8185–8191. https://doi.org/10.29303/jppipa.v9i10.4656

Hoddinott, J., Maluccio, J., Behrman, J., Flores, R., & Martorell, R. (2008). Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. *The Lancet*, *371*(9610), 411–416. https://doi.org/10.1016/S0140-6736(08)60205-6

Imdad, A., Yakoob, M. Y., &Bhutta, Z. A. (2011). Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. *BMC public health*, *11*, 1-14.

Jones, G., Steketee, R., Black, R., Bhutta, Z., & Morris, S. (2003). How many child deaths can we prevent this year? *The Lancet*, *362*(9377), 65–71. https://doi.org/10.1016/S0140-6736(03)13811-1

Karuga, R., Dieleman, M., Mbindyo, P., Ozano, K., Wairiuko, J., Broerse, J. E. W., &Kok, M. (2023). Community participation in the health system: Analyzing the implementation of community health committee policies in Kenya. *Primary Health Care Research and Development*, *24*. https://doi.org/10.1017/S1463423623000208

Lassi, Z. S., Rind, F., Irfan, O., Hadi, R., Das, J. K., &Bhutta, Z. A. (2020). Impact of infant and young child feeding (Iycf) nutrition interventions on breastfeeding practices, growth and mortality in low-and middle-income countries: Systematic review. *Nutrients*, *12*(3), 722. https://doi.org/10.3390/nu12030722

Makate, M., & Makate, C. (2018). Educated Mothers, Well-Fed and Healthy Children? Assessing the Impact of the 1980 School Reform on Dietary Diversity and Nutrition Outcomes of Zimbabwean Children. *Journal of Development Studies*, *54*(7), 1196–1216. https://doi.org/10.1080/00220388.2017.1380796

McDonald, C. M., McLean, J., Kroeun, H., Talukder, A., Lynd, L. D., & Green, T. J. (2015). Household food insecurity and dietary diversity as correlates of maternal and child undernutrition in rural Cambodia. *European Journal of Clinical Nutrition*, *69*(2), 242–246. https://doi.org/10.1038/ejcn.2014.161

Nabuuma, D., & Ekesa, B. (2024). Child feeding practices and male involvement in child feeding among smallholder farming households in Uganda. *International Journal of Agriculture Environment and Food Sciences*, *8*(1), 44–53. https://doi.org/10.31015/jaefs.2024.1.5

Ndela, B., Ngwala, P., N'siala, A., Kalonji, A., Minuku, F., Ntatukidi, N., ... &Mandja, B. A. (2022). Assessing the Accessibility and Healthcare Quality of Maternal and Child Health Services in Health Facilities of Kasai Province in the Democratic Republic of the Congo: A Cross-Sectional Study. *Journal of Pediatrics, Perinatology and Child Health*, *6*(3), 380-389.

Nguyen, P. H., Kim, S. S., Sanghvi, T., Mahmud, Z., Tran, L. M., Shabnam, S., Aktar, B., Haque, R., Afsana, K., Frongillo, E. A., Ruel, M. T., & Menon, P. (2017). Integrating nutrition interventions into an existing maternal, neonatal, and child health program increased maternal dietary diversity, micronutrient intake, and exclusive breastfeeding practices in Bangladesh: Results of a cluster-randomized program evaluation. *Journal of Nutrition*, *147*(12), 2326–2337. https://doi.org/10.3945/jn.117.257303

Nimpagaritse, M., Korachais, C., Nsengiyumva, G., Macq, J., &Meessen, B. (2019). Addressing malnutrition among children in routine care: How is the Integrated Management of Childhood Illnesses strategy implemented at health centre level in Burundi? *BMC Nutrition*, *5*(1). https://doi.org/10.1186/s40795-019-0282-y

Noor, M. H., HadiMahdi, A., Salih, K., Hamza, J. K., Mousa, R. F., & Abdul Hadi, S. F. (2020). Nutritional status of children under five years in baghdad. *Annals of Tropical Medicine and Public Health*, *23*(12). https://doi.org/10.36295/ASRO.2020.231219

Prendergast, A., & Humphrey, J. (2014). The stunting syndrome in developing countries. *Paediatrics and International Child Health*, *34*(4), 250–265. https://doi.org/10.1179/2046905514Y.0000000158

Robert, R. C., Creed-Kanashiro, H. M., Villasante, R., Narro, M. R., & Penny, M. E. (2017). Strengthening health services to deliver nutrition education to promote complementary feeding and healthy growth of infants and young children: formative research for a successful intervention in peri-urban Trujillo, Peru. *Maternal and Child Nutrition*, *13*(2), e12264. https://doi.org/10.1111/mcn.12264

Scott, K., Beckham, S. W., Gross, M., Pariyo, G., Rao, K. D., Cometto, G., & Perry, H. B. (2018). What do we know about community-based health worker programs? A systematic review of existing reviews on community health workers. *Human Resources for Health*, *16*(1), 1–17. https://doi.org/10.1186/s12960-018-0304-x

Shirazi, N., Afreen, A., & Khan, M. N. (2023). Effects of Nutrition Education Program on Lactating Mothers in Relation to Infant Feeding Practices. *BioScientific Review*, *5*(4), 80–96. https://doi.org/10.32350/bsr.54.07

Shrimpton, R., Victora, C. G., de Onis, M., Lima, R. C., Blossner, M., &Clugston, G. (2001). Worldwide timing of growth faltering: implications for nutritional interventions. *Pediatrics*, *107*(5), e75-e75.

Victora, C. G., Bahl, R., Barros, A. J., França, G. V., Horton, S., Krasevec, J., ... & Rollins, N. C. (2016). Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The lancet*, *387*(10017), 475-490.

Westgard, C., Naraine, R., &PaucarVillacorta, D. M. (2018). Performance evaluation of community health workers: case study in the Amazon of Peru. *Journal of community health*, *43*, 908-919. https://doi.org/10.1007/s10900-018-0503-3

World Health Organization. (2019). Strategy on nutrition for the Eastern Mediterranean Region 2020–2030. http://www.emro.who.int/nutrition/strategies-and-interventions/ index.html [accessed 05th September 2024].

Yao, H. C., & Yao, Y. Y. (1984). Ceria in automotive exhaust catalysts: I. Oxygen storage. *Journal of catalysis*, *86*(2), 254-265.https://doi.org/10.1111/mcn.13289

Zottarelli, L. K., Sunil, T. S., & Rajaram, S. (2007). Influence of parental and socioeconomic factors in stunting in children under 5 years in Egypt. *Eastern Mediterranean Health Journal*, *13*(6), 1330–1342. https://doi.org/10.26719/2007.13.6.1330

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