ORIGINAL ARTICLE

Maternal & Child Nutrition WILEY

Perceptions of stakeholders on the use of a simplified, combined protocol for treatment of acute malnutrition in Central African Republic

Francis M. Ngure[1] | Zachary Tausanovitch[2] | Grace A. Heymsfield[2] |
Siolo Mada Bebelou[3] | Parfait Seboulo[3] | Benedict Tabiojongmbeng[4] |
Anne Marie Dembele[5] | Issa Niamanto Coulibaly[6] | Victor Nikièma[7] |
Jeanette Bailey[2] | Suvi T. Kangas[2]

[1]Nutrition Research Consultant, Nairobi, Kenya

[2]International Rescue Committee, New York, New York, USA

[3]Ministry of Health and Population, Bangui, Central African Republic

[4]World Food Program, Bangui, Central African Republic

[5]United Nations Children's Fund, Bangui, Central African Republic

[6]International Rescue Committee, Bamako, Mali

[7]World Food Program Regional Bureau for West Africa, Dakar, Senegal

Correspondence
Francis M. Ngure, Nutrition Research Consultant, Nairobi, Kenya.
Email: francis.ngure@rescue.org and fmngure@gmail.com

Abstract

Treatment of acute malnutrition requires novel approaches to improve coverage, reduce costs and improve the efficiency of standard protocols that separate the management of moderate acute malnutrition (MAM) and severe acute malnutrition (SAM). The use of simplified, combined protocols to treat both MAM and SAM has drawn research and policy interest among global, regional and national stakeholders. However, the perspectives of local communities and health care workers regarding the use of protocols to treat acute malnutrition in a routine health care system are generally lacking. This was a cross-sectional mixed-methods study aimed at assessing the perceptions of different stakeholders on the use of a simplified, combined protocol in two districts in the Central African Republic. Most of the respondents preferred the simplified, combined protocol over the standard protocol. They generally agreed that the protocol was easy to understand, allowed more children to receive treatment and was effective in treating acute malnutrition. The protocol modifications were well received, including the expanded admission criteria, use of mid-upper arm circumference (MUAC) only for admission and discharge criteria and reduced and simplified ready-to-use therapeutic food quantity to treat MAM and SAM. Some caregivers expressed concern with the use of MUAC only to declare recovery, flagging that underlying illnesses could still be present. The caregivers recommended the provision of other food basket interventions to improve the treatment. The support by caregivers and health care workers on the idea of training community health volunteers to treat acute malnutrition points to the potential of scaling up decentralized treatment to increase coverage in remote areas.

KEYWORDS

Central African Republic, combined protocol, mid-upper arm circumference (MUAC), ready-to-use therapeutic food (RUTF), simplified, stakeholders, treatment of acute malnutrition

1 | INTRODUCTION

Acute malnutrition remains a major public health concern that requires novel treatment approaches. Globally, an estimated 45 million children under 5 (6.8%) are estimated to suffer from wasting at any point in time, of which 13.7 million (2.1%) have severe wasting (UNICEF, 2023). Wasting is categorized as either moderate or severe acute malnutrition (MAM and SAM). SAM is defined as weight-for-height <−3 standard deviation (z-scores) from the WHO reference median and/or mid-upper arm circumference (MUAC) <115 mm and/or oedema, whereas MAM is defined as weight-for-height from −3 to <−2 standard deviation (z-scores) from the WHO reference median and/or MUAC from 115 to <125 mm (WHO and UNICEF, 2009).

Traditionally, treatment of acute malnutrition has been costly and segmented. The standard care for malnutrition manages SAM and MAM separately, using different food products and protocols, even though the two present as a continuum. Under standard care, SAM is treated using ready-to-use therapeutic food (RUTF), while MAM is usually treated using ready-to-use supplementary food (RUSF). Additionally, during SAM treatment, RUTF dosage increases over the course of treatment and is based on the weight of the child; during MAM treatment, the dosage usually stays stable at 1 sachet (500 kcal) of RUSF per day representing only a supplement to the child's diet (UNICEF, 2020). The rather complex and divided treatment practices have resulted in a system that fails to meet the needs of malnourished children. Depending on the incidence factor used (1.6–3.5) (Isanaka et al., 2021), between 13% and 27% of acutely malnourished children can be estimated to benefit from life-saving treatment when considering that 9.3 million children with SAM (UNICEF, 2024) and 10 million children with MAM World Food Programme (WFP, 2024) were treated in 2023. This leaves most malnourished children exposed to a 3–12 times higher risk of mortality than their healthy counterparts in the same settings (Olofin et al., 2013).

Motivated by the need to improve coverage and reduce costs, there has been a growing interest in treating acute malnutrition using a simplified, combined protocol which involves (a) treating children with MAM and uncomplicated SAM at the same location; (b) using MUAC and oedema only as the admission and monitoring criteria; (c) using a single product, RUTF to treat both MAM and SAM and (d) prescribing a simplified dose and schedule for RUTF (two sachets/day for uncomplicated SAM and one sachet per day for uncomplicated MAM). These four components are also some of the most commonly implemented and researched simplified approaches (UNICEF, 2020). Previous studies have shown that treating acute malnutrition using the simplified, combined protocol has resulted in noninferior programme outcomes compared to standard protocol and in lower cost and consumption of RUTF per child treated (Bailey et al., 2020; Charle-Cuéllar et al., 2023), as well as high recovery rates in routine programming (Kangas et al., 2022).

The principles of the simplified, combined protocol have received much research attention and policy debate. In a study that examined the stakeholders' perspectives on the simplified, combined protocol in Niger, Nigeria, Somalia and South Sudan, respondents generally supported the idea of treating MAM and SAM in the same location (Dalglish et al., 2020). The respondents were personnel from the government, implementing partners, multi-lateral agencies and global and regional stakeholders. The new WHO guidelines have endorsed the suggestion of treating MAM with RUTF and the gradual reduction of RUTF dose during SAM treatment (WHO, 2023; World Health Organization & United Nations Children's Fund, 2023). The new WHO guidelines also recommend enabling and empowering community health workers to screen and treat uncomplicated cases of malnutrition within communities (WHO, 2023). Much has been documented from the global, regional and national stakeholders' perspectives, but the perspectives of caregivers and health care workers are lacking in the dialogue on the overall value of the simplified, combined protocol in the routine health care system.

In the context of an operational pilot implemented to observe the effectiveness of the simplified protocol in Central African Republic (CAR), a substudy was conducted to explore the perceptions and acceptability of the protocol for the management of acute malnutrition by communities and health workers. Specifically, the substudy aimed at assessing the perceptions of female caregivers and male guardians of malnourished children (referred to as caregivers and guardians), health care workers, local health authorities and implementation partners on the (i) effectiveness of treatment using the simplified protocol, (ii) acceptability and feasibility of the various components of the simplified protocol and (iii) opportunities for and threats to scaling up the simplified protocol. Unlike the previous study that examined stakeholders' knowledge and opinions on the combined protocol in treating MAM and SAM in emergencies (Dalglish et al., 2020; Kozuki et al., 2020), this study assessed perceptions among implementors, caregivers and guardians based on the actual implementation of the protocol in routine health care service delivery.

Key messages

- The use of the simplified, combined protocol to treat acute malnutrition received overwhelming support from most stakeholders involved in implementation.
- Stakeholders were supportive of the use of the protocol to provide care for both severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) children with a shorter length of stay in treatment.
- Most stakeholders supported the use of mid-upper arm circumference only for the admission and discharge of children.
- The majority of stakeholders reported that the ready-to-use therapeutic food given for MAM and SAM was sufficient for the child's recovery.
- The idea of training and equipping community health volunteers to treat acute malnutrition was well supported by caregivers and health care workers and should be explored further.

2 | METHODS

2.1 | Study design

The study was a cross-sectional mixed-method study involving both quantitative and qualitative data collection. Quantitative data were collected using questionnaires administered to health care workers and caregivers of children treated with the simplified, combined protocol. Qualitative data were collected through focus group discussions (FGDs) with caregivers and semistructured written interviews with implementing partners and local health authorities.

2.2 | Study setting and population

The study was conducted in the CAR, in the Health Districts of Kémo and Kouango-Grimari, in the south-central prefectures of Kémo and Ouaka. In 2019, an estimated 6.1% and 5.2% of children under five in Kemo and Ouaka prefectures suffered from either SAM or MAM (MSP, 2020). In 2021–2023, food insecurity in the subprefectures within Kemo and Ouaka ranged from crisis to emergency (IPC, 2021, 2022, 2023). The situation has been exacerbated by internal displacement due to persistent armed conflict. Overall, CAR is experiencing a severe health emergency characterized by a high mortality rate that has been grossly underestimated by the UN at less than one-fourth of the reality (Gang et al., 2023).

A simplified, combined treatment protocol had been implemented in the study area for the past 11 months to treat children with a MUAC <125 mm and/or oedema with two daily RUTF sachets for children with MUAC <115 mm and/or oedema and one daily sachet of RUTF for children with MUAC 115–124 mm. The treatment programme was implemented by Médecins d'Afrique (MDA) in the Kémo district and by the Community Humanitarian Emergency Board (CO-HEB) in the Kouango–Grimari district who were supporting the existing health system in the malnutrition treatment activities. These activities included training of health workers and daily supervision and support of treatment activities, supervision of community health volunteers (CHVs) to conduct active screening and tracing of malnutrition cases in the communities, management of treatment supplies, supporting record keeping and evaluation and secondary data collection of treatment data on electronic databases. The programmatic outcomes of this simplified, combined treatment programme published previously (Heymsfield et al., 2024) showed 81% recovery, 15% defaulting, 39 days average length of stay in treatment, 3.6 g/kg/d mean weight gain velocity and an average consumption of 43 RUTF sachets per child treated.

Four population groups were targeted. These were (i) caregivers and guardians of malnourished children treated with the simplified protocol, (ii) health care workers (nurses and CHVs) who had been providing the simplified malnutrition treatment, (iii) local health authorities from the two health districts and the region responsible for the nutrition services in the study area and who had been overseeing and supervising the simplified treatment pilot and (iv) implementing partners (MDA and COHEB) who had been supporting the simplified treatment activities in the health facilities.

2.3 | Sampling

A simple random sample of caregivers was drawn from an exhaustive list of malnourished children admitted to simplified treatment in the past 11 months. Using the Krejcie & Morgan (1970) formula, the parameters used were as follows: (i) target population of malnourished children: $N = 8379$ children admitted (included in treatment between July 2022 and May 2023); (ii) estimated prevalence (desired prevalence of satisfaction): $p = 50\%$; (iii) precision (minimum precision needed to achieve expected prevalence): $e = 7\%$ and (iv) z-value for 95% confidence limits: $t = 1.96$.

The minimum estimated sample size was 196 caregivers. Assuming a nonresponse rate of 20%, the total number of caregivers to be sampled was estimated as 235. Thus, 235 children were sampled from half of 58 health facilities from areas that were safe to visit and their caregivers approached. Seven health zones were excluded due to insecurity. Any absence or refusal was replaced from a reserve list of the selected caregivers. The sample was proportionally distributed in each of the 6 subprefectures of the study area according to their admission rate. A third of the guardians ($n = 78$) were interviewed out of the sample of 235 children/households.

For health care workers, a reasoned choice was made to survey 50% of the 58 health facilities where the simplified protocol was implemented. Ten health facilities were selected from each of the three categories defined based on reviewing higher/lower performing facilities, that is, high cure rate (>90%), intermediate (85%–90%) and low (<85%). In the 30 health facilities, the selected one health care worker and one CHV per facility were included in the survey resulting in a total of 30 nurses and 30 CHVs.

In qualitative research, reasoned choice sampling was used with different targets. Twelve focus groups were conducted with caregivers in the six subprefectures of the study area. In each subprefecture, two focus groups were conducted, including one in a more urban area and one in a rural area. Each focus group session was composed of 10–12 participants. The selection of women for the FGDs was done to allow homogeneity in terms of age and socio-demographic characteristics such as household food security and literacy levels.

Since the pilot on the simplified protocol was implemented in two districts grouped within a health region, an exhaustive sampling was done to survey the three structures for health authorities. Within these structures, a reasoned choice was made of the two personnel most involved in the management of malnutrition (the chief doctors of districts/health director of the region and their nutrition focal point). A total of six health authorities in the district and the region were engaged in semistructured written interviews.

For implementing partners, a reasoned choice across three categories of personnel per partner was made, that is, the project focal person in Bangui ($n = 2$), the technical manager of the project

at the field level (n = 2) and one support supervisor of health facilities per subprefecture (n = 6). In total, 10 people were engaged in the semi-structured individual interviews for the implementation partners.

Table 1 summarizes the sample size for each target group and data collection methods.

2.4 | Data collection

Individual interviews in the Sango language were conducted with caregivers, guardians and health care workers using electronic questionnaires configured on the CommCare platform and loaded on tablets. The questionnaires focused on overall perceptions and acceptability of the simplified, combined protocol and various components such as effectiveness of treatment and the reduction of RUTF and the use of MUAC only as the admission and discharge criteria. The data from the tablets were synchronized to the CommCare server whenever the internet connection was available to aggregate the data into the database.

FGDs were conducted in Sango and recorded with audio devices. The main topics of discussion were caregivers' perceptions of treatment with the simplified, combined protocol, perceptions on the reduction of RUTF, the advantages and disadvantages of management using the simplified, combined protocol and their perceptions on the possible management of acute malnutrition by CHVs. Semistructured individual interviews covering similar topics were conducted with health authorities and implementing partners. The interviews were recorded on paper forms by the respondents in French.

Data collection was carried out by a team of 22 locally recruited enumerators. The enumerators spoke the local Sango language and knew the area of intervention of the project. The 22 enumerators were paired (one man and one woman), one person was asked the questions and the other entered information into the tablet or took notes and recorded the session (in case of FGDs).

2.5 | Data analysis

Data analysis was conducted by an independent researcher who was not involved in the design or implementation of the study. Quantitative data were analyzed using STATA® version SE 18.0. Data cleaning steps included the removal of duplicates, outliers (values beyond a reasonable range for continuous variables) and redundant variables. Summary and descriptive statistics were computed for key variables included in the results section.

Audio records of FGDs in Sango were transcribed by summarizing the content in Sango, then translated into French and further into English. The summarized text was compared to the hand-written notes taken by the note-taker. The semistructured individual interviews that were collected directly on paper interview guides in French were typed and then translated into English. Content analysis of various categories of information or themes was done using NVIVO version 14. Some thematic areas covered in coding the qualitative data include the preferences, advantages and disadvantages of the simplified, combined protocol and the perceptions on and feasibility of individual components of the simplified, combined protocol (i.e., use of MUAC only as the admission and exit criteria, expanded admission criteria and the RUTF dose for SAM and MAM). Other areas were threats and opportunities for the simplified, combined protocol, reasons for defaulting and nonresponse to treatment, the potential use of CHVs to treat acute malnutrition and recommendations by various stakeholders. All codes were generated during the content analysis.

2.6 | Ethics

This study protocol was approved by the IRC Ethics Committee and the Ethics and Scientific Committee of the Faculty of Health Sciences of the University of Bangui. Written informed consent was obtained from all participants.

TABLE 1 Summary of sample size and data collection methods.

Target group	Sample size	Collection method	Data collection tools
Female caregivers of acutely malnourished children 6–59 months old	235	Quantitative: individual interview	Electronic questionnaire
Female caregivers of acutely malnourished children 6–59 months	12	Qualitative: focus group discussion	Focus group guide + discussion recording
Male guardians of acutely malnourished children 6–59 months	78	Quantitative: individual interview	Electronic questionnaire
Health care workers (nurses and CHVs)	60	Quantitative: individual interview	Electronic questionnaire
Health authorities (districts and region)	6	Qualitative: semistructured interview	Interview guide
NGO implementing partners	10	Qualitative: semistructured interview	Interview guide
Total	389 respondents for individual interviews and 12 focus groups		

Abbreviations: CHV, community health volunteer; NGO, nongovernmental organization.

3 | RESULTS

3.1 | Characteristics of the households surveyed

The study population was characterized by large households: an average of eight persons per household (Table 2). Apart from the malnutrition episode treated under the simplified, combined protocol, a third of the households reported that one of their children had already previously been treated for malnutrition. Half of the caregivers and a quarter of the guardians had no formal education. Half of caregivers were housewives and 44% were farmers. The majority of the guardians were farmers, herders or fishermen.

3.2 | Comparison of the simplified protocol to the standard programme

Overall, the majority of the respondents, including caregivers, health care workers, health authorities and implementing partners, preferred the simplified, combined protocol and shared similar advantages. Most (90%) of the health care agents had experience with the standard protocol before the switch to the simplified protocol. A great majority of the health care workers (all nurses and 93% of CHVs) preferred the simplified, combined protocol (Table 3). The health care workers preferred the simplified, combined protocol because it was easier to master. The health care workers received more help from

TABLE 2 Characteristics of the households surveyed.

Variable	Values
Household, n	236
Size (number of persons) mean ± SD	7.8 ± 3.7
Distance from the health facility (km), mean ± SD	2.1 ± 2.3
A child from the same household had been previously malnourished, n (%)	80 (34%)
Caregiver (female), n	236
Mother of the malnourished child, n (%)	225 (95%)
Age (years), mean ± SD	29.3 (8.8)
Number of children born alive, mean ± SD	3.8 ± 2.7
No formal education, n (%)	114 (48%)
Housekeeping, n (%)	113 (48%)
Farmer, n (%)	105 (44%)
Guardian (male), n	79
Head of household, n (%)	76 (96%)
Father of the malnourished child, n (%)	68 (86%)
Age (years), mean ± SD	40.1 ± 11.7
No formal education, n (%)	20 (25%)
Works in agriculture/herding/fishing, % (n)	76 (96%)

CHVs and partners, observed more attendance and children were less sick. Three out of every four health care workers observed that the overall workload with the simplified, combined protocol diminished, especially because using MUAC alone as the admission criterion made it easier and there was less work with the protocol.

Among caregivers who knew about the programme before it was simplified (n = 150), 94% preferred the simplified, combined protocol. In all 12 FGDs, caregivers shared (17 mentions) that the protocol was easy to understand and comply with, helped children to regain health and allowed caregivers to finish quickly and attend to field activities. The caregivers mentioned that the protocol allowed more children to receive treatment.

Similar advantages were reported by the implementing partners. They reported that the protocol was easy to understand and allowed many children to be treated using a single product for SAM and MAM. The implementing partners found the protocol to be effective in terms of saving time and allowing rapid recovery of MAM cases before they progressed to SAM, thereby reducing mortality. According to the partners, treating MAM and SAM in the same programme was economical since it reduced costs, benefited more children and avoided two programmes with separate budget allocations and reduced workload. Similar advantages were reported by health authorities.

> The protocol makes it possible to manage many children (MAM-SAM) by a single product (RUTF), (Implementing partner.)

> In our context, this is an asset, as standard care programs did not always cover MAM and SAM in the same area, making this care disparate and of little benefit to children. Putting it in the same program makes it possible to cover a maximum number of children and using a single input maximizes the results by lightening the task of the healthcare workers, with the logistics that go into it (Implementing partner.)

> Taking into account cases of MAM that are not always managed because of the unavailability of supplies and simplifying anthropometric measurements because the situation in CAR is such that more than 90% of health workers in health facility are not qualified (Implementing partner.)

> The second reason, despite the reduced amount of RUTF, but the MAM and SAM children heal well, and we did not experience a breakdown of RUTF input throughout the program as before (Implementing partner.)

The implementing partners and health authorities reported similar advantages of the simplified, combined protocol but also some disadvantages. The implementing partners observed that there was low awareness among clients on the reason for the reduction of RUTF and the lack of regular follow-up or home visits by health care workers.

TABLE 3 Comparison of the simplified protocol to the standard programme.

Health care workers	Nurses	CHVs
Prefer the simplified, combined protocol	30 (100%)	28 (93%)
If yes, why?		
It's easier to master	29 (97%)	26 (93%)
I have more help (CHVs and partners)	20 (67%)	13 (46%)
There is more attendance	13 (43%)	9 (32%)
Children are less sick	13 (43%)	12 (43%)
Thoughts on overall workload with the simplified protocol		
Constant	6 (20%)	8 (27%)
Decreased	23 (77%)	22 (73%)
If decreased, why?		
Less work with the simplified protocol (no z-scores, simple RUTF dosing)	22 (73%)	20 (67%)
Using MUAC alone as an admission criterion made life easier	29 (97%)	29 (97%)
Household participants	**Caregivers**	**Guardians**
Perception of the frequency of follow-up		
Followed (or knew of) weekly visits (for guardians)	233 (99%)	73 (92%)
Satisfied with the weekly visit frequency	222 (94%)	72 (91%)
Too frequent: I wish they were more spaced	6 (3%)	
Too rare: I wish they were more frequent	8 (3%)	

Note: All values are presented as *n* (%). Caregivers: *n* = 236, guardians: *n* = 79, nurses: *n* = 30, and CHVs: *n* = 30.

Abbreviations: CHV, community health volunteer; MUAC, mid-upper arm circumference; RUTF, ready-to-use therapeutic food.

One partner observed that there was no involvement of heads of centres, doctors and hospital staff in the activities related to the treatment of acute malnutrition. The health authorities were concerned with the limited duration of care for children, that UNICEF was the only donor for RUTF and the withdrawal of the MAM management component (usually carried out by WFP) and its funding.

Almost all caregivers and guardians were satisfied with the weekly frequency of treatment visits (Table 3). Similar observations were made during FGDs with caregivers (14 mentions in nine FGDs). The caregivers reported that the weekly visits allowed the children to grow, and caregivers to engage in fieldwork.

3.3 | Reasons for defaulting and nonresponse to treatment

In the FGDs with caregivers, several reasons for not completing the child's treatment were raised. Some caregivers dropped out or missed visits because they were busy with fieldwork or farming. Some caregivers were said to be tired of the weekly visits or to have taken unexpected trips. In one of the 12 FGDs, two mentions were made that caregivers were discouraged because they no longer received other foods such as corn-soy blend (CSB), in addition to RUTF.

Distance to health facilities was only mentioned as a challenge twice in two FGDs.

The caregivers raised several reasons for nonresponse to treatment. These were (i) failure to comply with treatment dose due to sharing and selling of RUTF, (ii) poor diet, (iii) other underlying diseases and (iv) poor hygiene. Selling of RUTF was mentioned six times in half of the FGDs, whereas sharing with other family members was mentioned four times in three FGDs.

Caregivers recommended other foods and medicines to be given to caregivers and children to encourage completion of the child's treatment and improve treatment of malnutrition. They suggested foods such as oil, sugar and CSB to be given to caregivers, as well as, milk, peanuts, oil, CSB with sugar (CSB+) and rice to children. They recommended the need to raise awareness to prevent and treat malnutrition, for example, on the importance of therapeutic rations, hygienic practices and cooking demonstrations.

3.4 | Perceptions on the adequacy of MUAC-only admission and exit criteria

The majority of caregivers perceived that monitoring children by MUAC alone was effective for the child's recovery (Table 4). Consistent with

TABLE 4 Perceptions on the MUAC and oedema-only admission and exit criteria.

Household participants	Caregivers	Guardians
Use of MUAC for anthropometric measurements		
Think that monitoring children by MUAC measurement alone is effective for a child's recovery	221 (94%)	
Satisfied if the treatment could be faster by taking only the MUAC (no more weight or height)	225 (95%)	
Health care workers	**Nurses**	**CHVs**
Admission criteria		
Easy to master	29 (97%)	29 (97%)
Saves more time	17 (57%)	16 (53%)
Reduces workload	21 (70%)	18 (60%)
Cure criteria		
Easy to master	30 (100%)	29 (97%)
Saves more time	18 (60%)	15 (50%)
Reduces workload	18 (60%)	16 (53%)
NOT using the weight-to-height ratio as an admission criterion		
Makes my job a lot easier	26 (87%)	28 (93%)
Afraid that some children will be excluded	10 (33%)	10 (33%)
Concerned that some children will not be treated well because they do not receive enough RUTF	13 (43%)	9 (30%)

Note: All values are presented as *n* (%). Caregivers: *n* = 236, guardians: *n* = 79, nurses: *n* = 30, and CHVs: *n* = 30.

Abbreviations: CHV, community health volunteer; MUAC, mid-upper arm circumference; RUTF, ready-to-use therapeutic food.

the quantitative data, caregivers were in favour of using MUAC alone to admit and treat malnourished children (17 mentions in all 12 FGDs). The caregivers asserted that MUAC was able to detect the child's weight loss or gain, malnutrition and whether the child was sick or suffering from diarrhoea. They mentioned that MUAC was easy and quick to use by caregivers and CHVs.

> Yes, at first the child does not eat, and it is through the measurement of MUAC that we realized that our child is suffering from malnutrition (Caregiver, Kemo.)

> My child was suffering from diarrhea, and it was thanks to the CHV who came to see and took his upper arm circumference that we realized that he is sick (Caregiver, Kemo.)

> Although this is an easy and quick way to use MUAC at home, accompanying caregivers must continue to be taught the meaning of the different colors (Red, Yellow, and Green) on the ribbon and how to refer to the hospital (Caregiver, Kemo.)

Several caregivers reported that the use of MUAC only was enough to show the child had recovered (16 mentions in 12 FGDs).

Ten of these mentions observed that the decision should be made or affirmed by the CHV, nurse or ambulatory therapeutic nutrition unit (UNTA) official, and counselling and follow-up should be done. Some caregivers observed that the use of MUAC only was not enough to show the child had recovered, particularly for children suffering from underlying, recurring illnesses and who might relapse (11 mentions in five FGDs). Overall, the thematic analysis was in favour of MUAC only enough to show the child had recovered.

Almost all the health care workers found the MUAC and oedema-only admission and exit criteria were easy to master (Table 4). The majority of the workers reported that the criteria reduced workload and saved time; they noted that removing WHZ as an admission criterion eased their workload. However, at least 30% of each of the health care workers were afraid that some children would be excluded or that some children would not be treated well because they did not receive enough RUTF.

3.5 | Perceptions on the effectiveness of treatment and adequacy of RUTF

Over 90% of the caregivers and guardians thought that the treatment for malnutrition following the simplified, combined protocol allowed for the child's recovery (Table 5). The majority (>80%)

TABLE 5 Perceptions on the effectiveness of treatment and amount of RUTF given or received.

Household participants	Caregivers	Guardians
Think that the treatment for malnutrition allowed for a child's recovery	220 (93%)	75 (95%)
Components of the treatment allow the cure		
Medical treatment (amoxicillin, antiparasite, antimalarial)	149 (63%)	47 (59%)
Nutritional treatment (RUTF)	198 (84%)	69 (87%)
Nutritional advice and education	167 (71%)	53 (67%)
Cooking demonstrations in the community	75 (32%)	
Perceptions on the amount of RUTF received		
Perceptions on the quantity of RUTF received the first time at a health facility (caregivers) or during treatment (for guardians)		
More than desired	94 (40%)	29 (37%)
As desired	107 (45%)	35 (44%)
Less than desired	35 (15%)	12 (15%)
Duration of a RUTF ration		
All week with leftovers	67 (28%)	
All week without leftovers	154 (65%)	
Finished before the next weekly visit	15 (6%)	
Health care workers	**Nurses**	**CHVs**
Quantity of RUTF given for a child admitted with MUAC <115 mm (SAM)		
Sufficient	27 (90%)	23 (77%)
Neutral	1 (3%)	1 (3%)
Insufficient	2 (7%)	6 (20%)
Quantity of RUTF given for a child admitted with a MUAC 115–124 mm (MAM)		
Sufficient	24 (80%)	25 (83%)
Neutral	1 (3%)	0 (0%)
Insufficient	4 (13%)	5 (17%)

Note: All values are presented as *n* (%) unless specified otherwise. Caregivers: *n* = 236, guardians: *n* = 79, nurses: *n* = 30, and CHVs: *n* = 30. Abbreviations: CHV, community health volunteer; MUAC, mid-upper arm circumference; RUTF, ready-to-use therapeutic food.

TABLE 6 Treatment by CHVs.

Household participants	Caregivers	Guardians
Training and equipping CHVs to treat acute malnutrition would be a good thing	226 (96%)	75 (95%)
Think the CHVs would be able to treat children properly	215 (91%)	74 (94%)
Would rather take their child to the CHV or health centre level		
CHV	153 (65%)	51 (65%)
Health facility	78 (33%)	28 (35%)
Reasons for preferring treatment by CHV		
Reduce the distance between home and treatment site	138 (90%)	44 (86%)
Less absence (due to distance)	76 (50%)	34 (67%)
Familiarity with CHV	109 (71%)	32 (63%)
Faster treatment (because fewer children treated compared to health facility)	70 (46%)	
Health care workers	**Nurses**	**CHVs**
Training and equipping CHVs to treat acute malnutrition would be a good thing	27 (90%)	29 (97%)
Why?		
Reduces the distance between home and pick-up sites	25 (93%)	27 (93%)
Less absence (due to distance)	17 (63%)	20 (69%)
Community familiarity with CHV	19 (70%)	22 (76%)
Less work/attendance at the health facility level	16 (59%)	11 (38%)

Note: All values are presented as *n* (%). Caregivers: *n* = 236, guardians: *n* = 79, nurses: *n* = 30, and CHVs: *n* = 30.
Abbreviation: CHV, community health volunteer.

Only 15% of the caregivers and guardians perceived that the quantity of RUTF received upon admission or during treatment was less than desired. Six percent of the caregivers reported that the RUTF ration was consumed before the next weekly visit. The majority of the health care workers reported that the quantities given during admission for SAM and MAM were sufficient (Table 5).

3.6 | Treatment by CHVs

Almost all caregivers and guardians supported the idea of training and equipping CHVs to treat acute malnutrition (Table 6). Over 90% of the caregivers and guardians thought that CHVs would be able to treat the children properly. Two-thirds of the caregivers and guardians would rather take their children to CHVs for treatment primarily because this would reduce the distance between home and treatment site: hence less absenteeism and familiarity with CHVs. In 12 FGDs with caregivers, 27 mentions were made in support of training

identified nutritional treatment (RUTF) as one of the components that allowed for a cure. Consistent with these findings, caregivers mentioned 20 times in 11 FGDs that the amount of RUTF can cure. Fewer mentions were made to the contrary (five mentions in four FGDs). Other components identified by over half of the caregivers and guardians were nutrition advice and education and medical treatment (Table 5).

CHVs to treat acute malnutrition. The caregivers supported the idea since CHVs were nearer, could treat acute malnutrition and bring the RUTF home. On the contrary, seven mentions were made in five FGDs that training CHVs to treat acute malnutrition is not a good idea and they may not be able to treat properly.

Similarly, the majority of the health care workers supported the idea of training and equipping CHVs to treat acute malnutrition for similar reasons given by caregivers (Table 6). In addition, 53% of the nurses and 37% of CHVs expected this to result in less work or attendance at health facility level.

3.7 | Opportunities and threats

Several caregivers reported that the simplified, combined protocol can work anywhere in CAR (19 mentions in 12 FGDs). They observed that implementing the protocol in CAR would increase the number of children benefitting from treatment, especially since the protocol had worked in their areas. Others observed that the protocol would not work in some contexts (nine mentions in six FGDs) due to negligence by some caregivers and threats posed by insecurity in some contexts; particularly due to food and financial crises accompanying displacements. Some caregivers highlighted the need to add CSB+, oil and medications for children the protocol to work.

The implementing partners and health authorities thought that the simplified, combined protocol could work anywhere in CAR with the availability of resources, especially RUTF and medicines, training and technical support for health care workers and adequate logistics and close monitoring. However, implementing partners noted that the protocol can fail due to a shortage of supplies, lack of technical support and qualified personnel and poor management at the family level (e.g., sharing and selling RUTF). Implementing partners and health authorities noted the protocol would not be optimal in contexts with insecurity, migration of people and hard-to-access areas due to long distances or poor roads.

4 | DISCUSSION

Overall, the simplified, combined protocol was well-perceived and supported by a majority of the stakeholders. Overall, the respondents identified more advantages than disadvantages. They found that the protocol was easy to understand and effective in treating acute malnutrition with a reduced RUTF dosage and shorter recovery duration. The inclusion of MAM allowed more children to receive treatment before they progressed to SAM. The use of MUAC-only criterion for admission and discharge was easy to master, saved time and reduced workload for health care workers. However, there were concerns that the use of the only criterion would exclude some children from receiving treatment.

Among the reasons for defaulting given by caregivers, none were related to the simplified, combined protocol. For example,

there was no direct reference to missing treatment visits due to receiving reduced RUTF. Similarly, the reasons given by caregivers for nonresponse to treatment were typical of any reasons for programme failure, and not specific to the simplified, combined protocol. For example, according to the caregivers, selling and sharing of RUTF could hinder recovery. Furthermore, the reasons why the protocol may not work in some contexts were typical of other treatment programmes and not inherent to the simplified, combined protocol.

The caregivers were satisfied with the treatment duration and weekly visits. The treatment according to the simplified, combined protocol did not take long and allowed caregivers to attend to other duties, especially fieldwork. This is an important factor to consider. Children admitted with MAM recovered on average in 1 month while children admitted with SAM needed on average 2 months to recover (Heymsfield et al., 2024). Allowing MAM children into treatment will reduce the length of treatment and make it less costly (in terms of opportunity cost) for the caregivers. The weekly treatment visits were not perceived as a challenge by the caregivers. Usually, the frequency of visits during MAM treatment is every 2 weeks. However, among the participants in this survey, the average distance from the health facility to the households was only 2 km. In a context where households are far away from the health facility, weekly visits might be more challenging and fortnight visits might need to be considered particularly for the MAM phase of treatment.

The expanded admission criterion was perceived positively by caregivers, health authorities and implementing partners who appreciated that more children would now be eligible for treatment. The larger operational pilot study demonstrated an increased caseload due to the expanded admission criteria covering children with MAM (Heymsfield et al., 2024). However, in this substudy, the health care workers perceived the workload to have decreased, especially due to the use of the simpler and faster MUAC-only criteria. The majority of the health care workers appreciated the idea of saving time by not using a child's weight and height measurements in monitoring recovery or progress. Health care workers perceived this led to more attendance at the health facility which was seen as a positive consequence of the expanded admission.

Overall, the stakeholders were in support of the use of MUAC only for the admission and discharge of children under the simplified, combined protocol. However, some caregivers expressed concerns that such a criterion may not suffice for children with underlying illnesses who are likely to relapse soon after being discharged. Similarly, between 30% and 43% of the health care workers were concerned that some children would be excluded or not treated well because they did not receive enough RUTF if WHZ was not used as an admission criterion. In a previous study targeting decision-makers rather than implementors, there was less agreement among respondents on the use of MUAC as the sole criterion for diagnosis and discharge, especially outside emergency situations (Dalglish et al., 2020). Many of the respondents in four countries said MUAC

and WHZ were not interchangeable. A few respondents emphasized that using MUAC and oedema only might not detect all acutely malnourished children and may not be appropriate for tall and slender children (Dalglish et al., 2020).

In adopting the simplified, combined protocol to various contexts, the RUTF quantity should be a major consideration. The majority of stakeholders reported that the RUTF provided (seven and 14 sachets for MAM and SAM, respectively) was sufficient to cure a malnourished child. Only 15% of caregivers perceived that the RUTF ration given as less than desired, and 6% of the caregivers reported that the weekly ration was finished before the next follow-up visit. This is consistent with a previous study which demonstrated that reducing the dose of RUTF did not affect the availability of RUTF during the treatment but reduced leftovers and the frequency of consumption of RUTF in a day (Nikièma et al., 2022). The new WHO treatment criteria recommend the reduction of RUTF dose for children with SAM when they progress to the MAM stage and giving the RUTF ration based on the weight of the child (WHO, 2023). However, reducing RUTF in highly food-insecure settings might not be optimal. Caregivers in this study requested medical and food assistance. They identified this as a key factor enabling the future success of the simplified, combined protocol. Sharing of RUTF among family members or selling the RUTF to procure food commodities were both mentioned and demonstrated that some households were highly food insecure and vulnerable. There is a dire need for general food aid/distribution in CAR (Gang et al., 2023).

The use of a single treatment product for SAM and MAM and at reduced dosages for SAM was a major advantage of the protocol. The implementing partners and health authorities found this to be economical since it led to savings in terms of the total quantity of product needed and more children were treated. Treating MAM cases before they progressed to SAM was named a major advantage of the protocol. Avoiding two separate programmes and supply chains was an advantage since it reduced workload. However, relying on UNICEF only for procurement of RUTF was perceived as one of the challenges. The authorities and partners were also concerned about decreased overall funding if WFP pulled out its funding for MAM programming. These fears were also previously reported by decision-makers from four countries interviewed on the advantages and challenges of the simplified, combined protocol (Dalglish et al., 2020).

Training and equipping CHVs to treat uncomplicated acute malnutrition was identified as an opportunity to increase coverage and accessibility of treatment in remote areas. This is very encouraging since the new WHO guidelines recommend training and equipping CHVs to treat malnutrition in their communities (WHO, 2023). According to our study, there is an opportunity to explore CHV treatment in CAR if the conditions for adequate training and supervision are met. Successful treatment of acute malnutrition using CHWs has been reported in Mali (Charle-Cuéllar et al., 2022; Kangas et al., 2022) and Tanzania (Wilunda et al., 2021).

This study shows potential for scaling up treatment of acute malnutrition using the simplified, combined protocol. Generally, caregivers, health authorities and implementing partners agreed that the simplified, combined protocol can work anywhere in CAR provided there are sufficient resources and technical support to enable the switch of protocol. Areas with high insecurity and poor accessibility were seen as risky contexts for successful implementation. In these contexts, enabling a more decentralized treatment (via CHVs) might help consistent treatment delivery. The use of the simplified, combined protocol to enable decentralization in high-security areas should be explored.

This study had several strengths and limitations. This is the first study that documents the views of health care workers and caregivers on the simplified, combined protocol in an implementation setting. The study shows preference and clear advantages of using the protocol among various stakeholders across the health care system. However, the random sampling of households was restricted to those accessible to the health facilities and it remains unclear how the perceptions of stakeholders would change in more remote places. The use of mixed methods for various stakeholders allowed the comparison of data across methods and questions with similar themes. Overall, there was concurrence between quantitative and qualitative data to support various findings among the stakeholders. However, the study had several limitations related to data collection. The variable duration of FGDs with caregivers (30–65 min) might have affected the quality and depth of some qualitative data. Summarized transcriptions of FGDs limited the ability to use direct quotations. The use of paper-based surveys with local health authorities and partners limited the depth of information captured in the questionnaire.

5 | CONCLUSION

The use of the simplified, combined protocol to treat acute malnutrition in the two districts in CAR was largely perceived positively and supported by most stakeholders. Overall, the perceived advantages of the simplified, combined protocol far outweighed the perceived disadvantages. However, careful considerations should be made on the suitability of the protocol and its individual components to each context. For example, in food-insecure contexts, the reduction of RUTF dose during treatment may not be optimal or could be accompanied by general food distributions as highlighted by caregivers participating in this study.

Further research is recommended on the impact of increased caseload with the simplified, combined protocol on the overall workload. It remains unclear why health care workers perceived the overall workload was less when implementing a simplified, combined protocol than the standard protocol with weight for height, despite the significant increase in the number of children treated with the expanded admission criteria (SAM and MAM). There is also a need to explore the decentralization of treatment through CHVs and what protocol adaptations would be required to allow them to deliver treatment effectively in insecure settings.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Grace A. Heymsfield https://orcid.org/0009-0004-2614-2215
Victor Nikièma https://orcid.org/0000-0001-8334-8579

REFERENCES

Bailey, J., Opondo, C., Lelijveld, N., Marron, B., Onyo, P., Musyoki, E. N., Adongo, S. W., Manary, M., Briend, A., & Kerac, M. (2020). A simplified, combined protocol versus standard treatment for acute malnutrition in children 6–59 months (ComPAS trial): A cluster-randomized controlled non-inferiority trial in Kenya and South Sudan. *PLoS Medicine*, *17*(7), e1003192. https://doi.org/10.1371/journal.pmed.1003192

Charle-Cuéllar, P., Espí-Verdú, L., Goyanes, J., Bunkembo, M., Samake, S., Traore, M., Coulibaly, A. B., Landouré, A., Diawara, F., Dougnon, A. O., Vargas, A., & López-Ejeda, N. (2022). Scaling severe acute malnutrition treatment with community health workers: A geospatial coverage analysis in rural Mali. *Human Resources for Health*, *20*(1), 74. https://doi.org/10.1186/s12960-022-00771-8

Charle-Cuéllar, P., Lopez-Ejeda, N., Aziz Gado, A., Dougnon, A. O., Sanoussi, A., Ousmane, N., Hamidou Lazoumar, R., Sánchez-Martínez, L. J., Toure, F., Vargas, A., & Guerrero, S. (2023). Effectiveness and coverage of severe acute malnutrition treatment with a simplified protocol in a humanitarian context in Diffa, Niger. *Nutrients*, *15*(8), 1975. https://doi.org/10.3390/nu15081975

Dalglish, S. L., Seni Badou, M., Sirat, A., Abdullahi, O., Adalbert, M. F. E., Biotteau, M., Goldsmith, A., & Kozuki, N. (2020). Combined protocol for severe and moderate acute malnutrition in emergencies: Stakeholder perspectives in four countries. *Maternal & Child Nutrition*, *16*(2), 1–11. https://doi.org/10.1111/mcn.12920

Gang, K. B. A., O'Keeffe, J., Anonymous, & Roberts, L. (2023). Cross-sectional survey in Central African Republic finds mortality 4-times higher than UN statistics: how can we not know the Central African Republic is in such an acute humanitarian crisis. *Conflict and Health*, *17*(1), 21. https://doi.org/10.1186/s13031-023-00514-z

Heymsfield, G., Tausanovitch, Z., Christian, L. G., Bebelou, M., Mbeng, B. T., Dembele, A. M., Fossi, A., Bansimba, T., Coulibaly, I. N., Nikièma, V., & Kangas, S. T. (2024). Effectiveness of acute malnutrition treatment with a simplified, combined protocol in Central African Republic: An observational cohort study. *Maternal & Child Nutrition*, *20*(4), 13691. https://doi.org/10.1111/mcn.13691

IPC. (2021). *Central African Republic: Acute food insecurity and malnutrition situation for September 2021–August 2022*. https://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1155199/?iso3=CAF

IPC. (2022). *Central African Republic: Acute food insecurity situation for September 2022—March 2023 and projection for April–August 2023*. https://www.ipcinfo.org/ipc-country-analysis/detailsmap/en/c/1156015/?iso3=CAF

IPC. (2023). *Central African Republic: Acute food ins–August 2024*. https://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1156637/?iso3=CAF

Isanaka, S., Andersen, C. T., Cousens, S., Myatt, M., Briend, A., Krasevec, J., Hayashi, C., Mayberry, A., Mwirigi, L., & Guerrero, S. (2021). Improving estimates of the burden of severe wasting: Analysis of secondary prevalence and incidence data from 352 sites. *BMJ Global Health*, *6*(3), e004342. https://doi.org/10.1136/bmjgh-2020-004342

Kangas, S. T., Marron, B., Tausanovitch, Z., Radin, E., Andrianarisoa, J., Dembele, S., Ouédraogo, C. T., Coulibaly, I. N., Biotteau, M., Ouologuem, B., Daou, S., Traoré, F., Traoré, I., Nene, M., & Bailey, J. (2022). Effectiveness of acute malnutrition treatment at health center and community levels with a simplified, combined protocol in Mali: An observational cohort study. *Nutrients*, *14*(22), 4923. https://doi.org/10.3390/nu14224923

Kozuki, N., Seni, M., Sirat, A., Abdullahi, O., Adalbert, M. F. E., Biotteau, M., Goldsmith, A., & Dalglish, S. L. (2020). Adapting acute malnutrition treatment protocols in emergency contexts: A qualitative study of national decision-making. *Conflict and Health*, *14*(1), 47. https://doi.org/10.1186/s13031-020-00293-x

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607–610. https://doi.org/10.1177/001316447003000308

MSP, R. C. A. (2020). Rapport final. Enquête nationale sur la situation nutritionnelle et la mortalité en République Centrafricaine 2020. https://files.aho.afro.who.int/afahobckpcontainer/production/files/RAPPORT_FINAL_ENQUETE_NUTRITIONNELLE_RCA_2019.pdf

Nikièma, V., Fogny, N. F., Kangas, S. T., Lachat, C., & Salpéteur, C. (2022). Availability, use, and consumption practices of ready-to-use therapeutic foods prescribed to children with uncomplicated severe acute malnutrition aged 6–59 months during outpatient treatment in Burkina Faso. *Appetite*, *168*, 105751. https://doi.org/10.1016/j.appet.2021.105751

Olofin, I., McDonald, C. M., Ezzati, M., Flaxman, S., Black, R. E., Fawzi, W. W., Caulfield, L. E., & Danaei, G. (2013). Associations of suboptimal growth with all-cause and cause-specific mortality in children under five years: A pooled analysis of ten prospective studies. *PLoS One*, *8*(5), e64636. https://doi.org/10.1371/journal.pone.0064636

UNICEF. (2020). Simplified approaches for the provision of care to children with wasting and other forms of acute malnutrition, 1–2. https://doi.org/10.1186/s13690-018

UNICEF. (2023). Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group joint child malnutrition estimates: Key findings of the 2023 edition. *World Health Organization*, *24*(2), 32.

UNICEF. (2024). Annual report 2023. New York, United Nations Children's Fund (UNICEF). https://www.unicef.org/reports/unicef-annual-report-2023

WFP. (2024). WFP nutrition in numbers 2023. World Food Programme. https://www.wfp.org/publications/2023-wfp-nutrition-numbers

WHO. (2023). *WHO guideline on the prevention and management of wasting and nutritional oedema in infants and children under 5 years*, 1–188.

WHO & UNICEF. (2009). *WHO child growth standards and the identification of severe acute malnutrition in infants and children*.

Wilunda, C., Mumba, F. G., Putoto, G., Maya, G., Musa, E., Lorusso, V., Magige, C., Leyna, G., Manenti, F., Dalla Riva, D., Ntoga, B. A., & Segafredo, G. (2021). Effectiveness of screening and treatment of children with severe acute malnutrition by community health workers in Simiyu region, Tanzania: A quasi-experimental pilot study. *Scientific Reports*, *11*(1), 2342. https://doi.org/10.1038/s41598-021-81811-6

World Health Organization & United Nations Children's Fund. (2023). *Simplified approaches' in relation to the new WHO guideline on the prevention and management of wasting and nutritional edema (acute malnutrition)*, 1–7. https://www.childwasting.org/_files/ugd/2b7a06_1422a810609c42c8a4d02a7b516ff3c3.pdf