Original Article

Locally produced cereal/nut/legume-based biscuits versus peanut/milk-based spread for treatment of moderately to mildly wasted children in daily programmes on Nias Island, Indonesia: an issue of acceptance and compliance?

Veronika Scherbaum MSc, PhD[1,2], Ratna Chrismiari Purwestri MSc, PhD[2,3], Wolfgang Stuetz MSc, PhD[4], Dyah Ayu Inayati MPhil, PhD[1], Julia Suryantan MD, MSc[5], Maurice Alexander Bloem MSc[6], Hans Konrad Biesalski MD, PhD[2]

[1]*Institute for Social Sciences in Agriculture, Department of Gender and Nutrition, University of Hohenheim, Stuttgart, Germany*
[2]*Institute for Biological Chemistry and Nutrition, University of Hohenheim, Stuttgart, Germany*
[3]*Faculty of Medicine, Nutrition Department, University of Brawijaya, Malang, Indonesia*
[4]*Institute of Nutrition, Friedrich-Schiller-University of Jena, Jena, Germany*
[5]*Church World Service Indonesia, Jakarta, Indonesia*
[6]*Church World Service, New York, USA*

Background: Treatment effects of fortified ready-to-use foods for moderately to mildly wasted children are largely unknown. **Methods**: Two nutritionally comparable forms of locally produced ready-to-use foods for daily feeding programmes of moderately to mildly wasted children (weight-for-height Z-score/WHZ≥-3 to <-1.5SD) were assessed on Nias, Indonesia. The frequencies of reaching target WHZ≥-1.5SD, compliance to the ready-to-use food programme, and weight gain until recovery or programme closure among children treated with peanut/milk-based spreads (n=29) were compared among children receiving cereal/nut/legume-based biscuits (n=44) and a second group treated with cereal/nut/legume-based biscuits whose mothers received intensive nutrition education (n=38). **Results**: Children in the cereal/nut/legume-based biscuits groups were younger (31 and 33 vs 39 months, p=0.004) and more likely to be moderately wasted (45 and 39 vs 21% with WHZ<-2, p=0.114) at admission, but had a higher rate in recovery (84 and 79 vs 62%, p=0.086) and showed more frequently a high compliance (>80%) to the ready-to-use (86 and 84 vs 45%, p<0.001) than those children in the peanut/milk-based spreads programme. Multivariable logistic regression revealed high compliance followed by weight gain and a lower degree of wasting at admission as independent and significant predictors of reaching target WHZ≥-1.5SD (all p<0.01). Weight gain was positively associated with the consumption of the biscuits (vs peanut//milk-based spreads: r=0.188, p=0.051) and was highest in the cereal/nut/legume-based biscuits plus intensive education compared with the cereal/nut/legume-based biscuits and peanut/milk-based spreads groups. **Conclusions**: Locally produced ready-to-use foods as biscuits or spreads were similarly effective for rehabilitation of moderately to mildly wasted children.

Key Words: fortified ready-to-use foods (RUFs), supplementary feeding, moderately to mildly wasted children, weight gain, programme compliance

INTRODUCTION

Worldwide, it is estimated that around 3.5% of children under the age of five years are suffering from severe acute malnutrition (SAM) and 10% from moderate acute malnutrition (MAM). This implies that about 19 million children are severely wasted and 55 million are moderately wasted.[1] Left untreated, these conditions have a significant impact on child morbidity often associated with infectious diseases and increased mortality.[2] Additionally, chronic forms of malnutrition are often associated with life-long consequences and negative intergenerational effects leading to poor cognitive and social capabilities as well as poor school and work performance. This contrib-

Corresponding Author: Dr Veronika Scherbaum, Institute for Social Sciences in Agriculture, Department of Gender and Nutrition (430), University of Hohenheim, Schloss, Museumsfluegel, 70593 Stuttgart, Germany.
Tel: + 49 711 459-23496; Fax: + 49 711 459-23496
Email: veronika.scherbaum@uni-hohenheim.de
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utes to high health care costs and is related to the social exclusion of the poor.[3]

The provision of micronutrient-enriched supplements, often combined with intensive nutrition and health education, has been shown to have a positive impact on the treatment/prevention of moderate to milder forms of child malnutrition.[4-8] In the treatment of severely wasted children, ready-to-use therapeutic foods (RUTFs) have proved to be effective in hospital and community-based studies mainly carried out in countries of Sub-Sahara Africa.[9-13] Research on moderately to mildly wasted or underweight children started a few years later; in most of these studies, the same standard type of RUTF (based on peanut butter, milk powder, sugar, vegetable oil and a vitamin-mineral premix) was used for severe cases,[14,15] with a few exceptions where cereal-based ready-to-use foods (RUFs) with comparable but not identical macro- and micronutrients were used.[16,17] While the majority of RUTFs/RUFs sold on a worldwide scale are still commercially produced,[18] there is growing interest in reducing costs through local production and alternative cereal-based formulations.[19-22] RUTF/RUFs for severely and moderately wasted children contain approximately 500 kcal per 100 g[23,24] and have to be differentiated from ready-to-use supplementary foods (RUSFs), which contain similar amounts of micronutrients but less energy. As shown by two recent Cochrane analyses, no internationally agreed consensus exists regarding the most effective dietary management of severe and moderate forms of wasting.[25,26]

During the planning phase of this study, no results were yet available regarding the acceptability and effectiveness of peanut-milk based RUFs in comparison with cereal-based, similar products for treatment of moderately wasted children. Therefore, a study comparing the effectiveness of peanut/milk-based spread (PM-S) with cereal/nut/legume-based biscuits (CNL-B) on moderately to mildly wasted children was conducted on Nias Island, Indonesia. Both dietary treatments were locally prepared in the study area and consisted of comparable macro- and micronutrients.[27] As the acceptability of dietary products and compliance with supplementary feeding programmes is known to be of major importance,[28] socio-cultural factors influencing the acceptance of dietary interventions among caretakers and concerned children were also explored.

METHODS

Setting and study design

In 2007, about two years after Nias Island was hit by a disastrous tsunami, the prevalence of wasting among children under five years was 11.9%.[29] In close cooperation with Church World Service Indonesia (CWS), a nutrition centre-based intervention study was planned and conducted on Nias Island between October 2007 and June 2008. Due to clear differences in the appearance and consistency of the cereal/nut/legume-based biscuits (CNL-B) and peanut/milk-based spread (PM-S), a randomized, double blind study design could not be performed. Although the macro- and micronutrient content of the food supplements were within the range of requirements for severely wasted children, the term RUF was used because the products were applied for moderately to mildly wasted children.[27] Nutrition centres where children received PM-S were clearly distanced from those which were assigned to receive CNL-B in order to avoid misunderstandings of caregivers regarding these two obviously different types of RUFs with a similar nutrient content applied in this study (see Figure 1). Both regions had a comparable socio-economic status.[30] Originally, it was planned that in addition to the already ongoing non-intensive nutrition education sessions on a monthly basis, the effect of the newly developed intensive nutrition education (INE) should also be evaluated in both intervention programmes. However, due to continuous unexpected problems of acceptance and compliance in the PM-S programme, INE was only introduced in one arm of the CNL-B programmes, as shown in Figure 1 and Table 1. As previously published, INE was successfully applied in weekly programmes among mildly wasted children in a separate area of Nias Island.[7,8]

Target group

Moderately and mildly wasted children with a weight-for-height z-score (WHZ) ≥-3 to <-1.5SD according to WHO standard references,[31] aged ≥6 to <60 months, and with no sign of birth defects or disease which would limit the *ad libitum* food intake, were screened for programme recruitment through community-based monthly growth monitoring activities ("*Posyandu*") implemented by the CWS and the Government of Indonesia. Children were admitted on the basis of parents' informed consent and were individually discharged after they reached WHZ≥-1.5SD.

Table 1. Activities in the PM-S, CNL-B, or CNL-B+INE programmes

Activity	PM-S	CNL-B	CNL-B+INE
Type of food	PM-spreads	CNL-biscuits	CNL-biscuits
Local food production	Every day	1-2x per week	1-2x per week
Food distribution and supervision	Every day	Every day	Every day
Recall of food supplement intake	Every day	Every day	Every day
Length/Height measurement	Once a month	Once a month	Once a month
Taking weight	2-3x per week	2-3x per week	2-3x per week
Morbidity recall	Every day	Every day	Every day
Non-INE	Once a month	Once a month	-
INE	-	-	2-3x per week

PM-S: peanut/milk-based spreads programme; CNL-B: cereal/nut/legume-based biscuits programme; INE: intensive nutrition education.

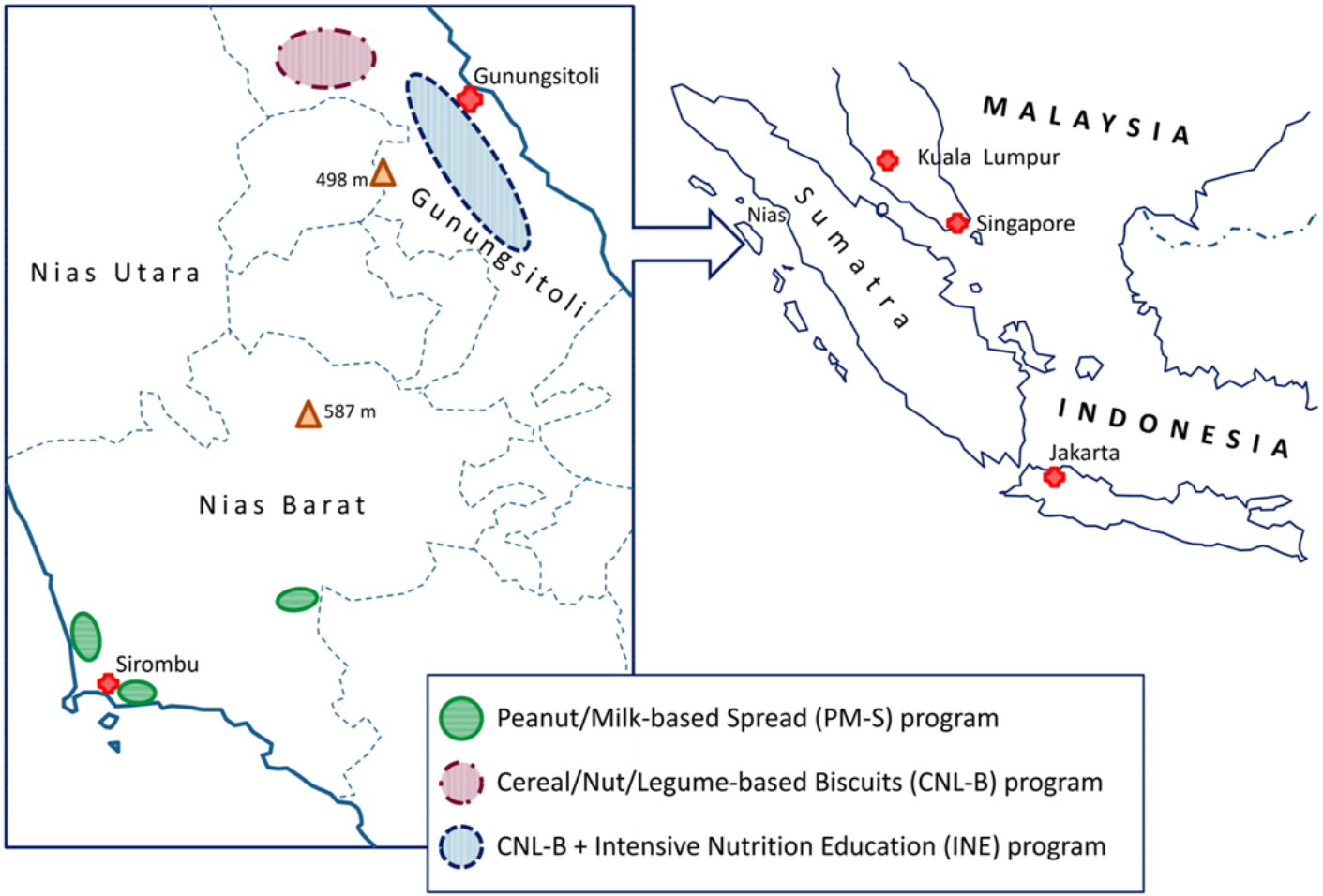

Figure 1. Group/programme allocation on Nias Island, Indonesia

Field testing of CNL-B

In 2006, nine different therapeutic recipes (consisting of rice, wheat, manioc, groundnut, cashew nut, coconut, sesame seed, soybean, kidney bean, mungbean, fish flour, milk powder, sunflower oil, palm oil, eggs and sugar) were developed and tested at the University of Hohenheim.[32] In early 2007, four of the newly developed nine recipes were reproduced, based on the availability of ingredients on Nias Island, and were tested on wasted children and their caretakers. On the basis of a sensory evaluation, the two most favoured recipes were selected for local production and were applied in this study.[27]

Field testing of PM-S

Part of the study team had previously gained insight into local production of PM-S during a pilot survey in Uganda.[33] In contrast to the positive experience in Uganda, unexpected strong reservations from voluntary workers and caregivers were observed in the PM-S programme on Nias Island. Originally, their main concerns were related to the unusual appearance of the PM-S and the taste of whole milk powder and peanut butter, although whole peanuts were available and consumed in the project area. Consequently, we modified the recipe by using skimmed instead of whole milk powder and produced peanut flour instead of peanut butter. In addition, the palm oil was heated prior to PM-S production. After these modifications in the preparation process, there was originally a consensus that the PM-S would be accepted by wasted children and their caretakers in the project area.

Local production and distribution of CNL-B and PM-S

At village/nutrition centre level, both RUF-types were locally produced with the help of trained voluntary workers and some motivated caregivers. PM-S comprised of peanut flour, palm oil, refined sugar, vitamin mineral mix and either skimmed milk powder or whole milk powder, depending on availability and the preferred taste of caregivers and their children. The PM-S was produced, distributed and consumed on the same day due to lack of access to refrigerators in the study centres. Similarly, consumption of the commercially produced standard RUTF-spread is recommended within one day of the package being opened.

In contrast, CNL-B was produced once or twice a week, depending on the number of children admitted in the daily nutrition programmes. Ingredients of the locally produced CNL-B were wheat flour, peanut flour, refined sugar, palm oil, eggs (yolk and white) and soybean or mungbean flour which was used interchangeably. Peanut, soybean and mungbean flour were roasted prior to biscuit production.

Both CNL-B and PM-S were fortified with the same amount of micronutrient powder (2.7 g/100 g) donated from DSM, and consisted of about 500 kcal and 7-10% protein. The macro- and micronutrient content of both supplements were in accordance with recommendations of WHO, WFP, UN-SCN and UNICEF for rehabilitation of severe acute malnutrition.[34] At the onset of this study, different micronutrient recommendations for children suffering from severe versus moderate forms of acute malnutrition were not yet available.

The required amount of CNL-B or PM-S was calculated according to the actual weight of the respective child, and covered a maximum of 60% of the recommended daily energy requirement of Indonesian children (±500 kcal).[35] Thus, a child with a body weight of about 9 kg was assigned to consume about 100 g PM-S or CNL-B (6-7 pieces) as a snack between family meals. A major part of this supplementary snack was consumed under the supervision of the project staff in the on-going daily nutrition intervention programmes. Other activities in the CWS nutrition centres, as well as the methodology of the study, were described in detail in advance.[17,19,24]

Field testing of INE

In contrast to non-intensive nutrition education that was already ongoing prior to the onset of this study on a monthly basis, intensive nutrition education (INE) was designed in consideration of local nutrition experts and cultural food and feeding habits. Detailed information about the development and evaluation of INE programmes has been already published.[7,8]

Qualitative research methods

Home visits and in-depth interviews were planned for caregivers of children who did not consecutively attend these daily programmes for more than three days. During home visits, the child was examined and the caregivers were encouraged and advised to comply with the programme for the sake of the nutrition/health status of their child. For caregivers who were hesitant to permit their wasted children to join the PM-S programme, a special focus group discussion (FGD) was employed during the opening hours of the nutrition centre to understand their specific reasons for dismissal. During the FGDs one facilitator moderated the discussion and an assistant took written notes. In addition to the FGDs, in-depth interviews were performed with eight voluntary workers from seven nutrition centres to gain a better understanding of the reasons why some caregivers were so reluctant to allow their children to join and remain in the PM-S programme. Caregivers of children who did not reach target WHZ were also asked to share their opinion about the respective supplementary feeding programme during in-depth interviews. Apart from the mentioned systematic qualitative investigations, spontaneous expressed perceptions of caregivers and their concerns, especially regarding the PM-S, were continuously recorded.

Sample size calculation

To detect a weight increment of 2.1±2.4 g/kg body weight/day (g/kg/day),[13] with a confidence level of 95% and a power of 0.8, a minimum sample size of 20 children per programme was calculated.[36]

Data management and statistical analysis

Data were described using means (SD), frequencies (%) and geometric means with 95% confidence intervals (for skewed data). Data on weight and height were transformed to Z-scores (WHZ) according to WHO reference data using Emergency Nutrition Assessment (ENA for SMART version 2007). Differences in children's charac-

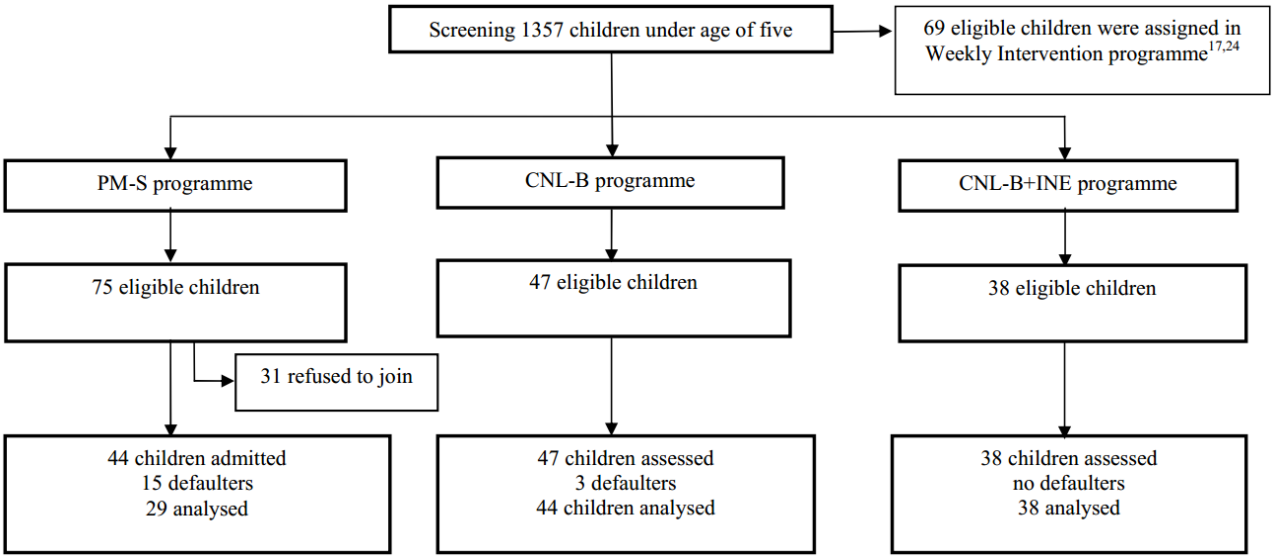

Figure 2. Study profile of children receiving PM-S, CNL-B, and CNL-B+INE programme. PM-S: Peanut/milk-based spreads programme; CNL-B: Cereal/nut/legume-based biscuits programme; CNL-B and intensive nutrition education (INE).

teristics and anthropometrics at admission and discharge between groups were compared by one-way ANOVA with Bonferroni's multiple comparisons test and the chi-squared test. Multivariable logistic regression analysis with a forward stepwise approach was applied to identify independent predictors with regard to reaching the recovery criterion (WHZ≥-1.5SD). The following covariates, which were significantly associated with recovery, were included in the initial model: WHZ at admission, WHZ distance at admission to ≥-1.5SD, provision of CNL-B, weight gain, length of stay in the respective programmes and compliance with the food supplement. Linear regression models were used to analyse associations of weight gain with compliance, recovery, CNL-B consumption, WHZ at admission and the length of staying in the programme. All statistical analysis was carried out using SPSS software (SPSS Inc.; Chicago, IL; Version 11.5).

Ethical considerations

The study followed the ethical guidelines of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000) and, together with the informed consent statement, was approved by the Ethical Committee of the Faculty of Medicine, University of Brawijaya, Malang, Indonesia (No. 25/PEPK/VIII/2007). Brief information of the study objectives, plan of activities and voluntary participation was explained in the native language to the respective caregivers. Then, written consent was obtained by all participating caretakers prior to the onset of this study. In addition, caregivers were informed that they could withdraw from the study at any time. The signed consent forms were brought by one of our co-authors to the University of Brawijaya and are filed there.

RESULTS

Of 1357 children who were screened in the community-based screening programmes in the CWS catchment areas, 160 children were eligible for the intervention programmes in the different project areas (Figure 1 and 2). Thirty-one wasted children who were allocated for the PM-S programme were not allowed to participate by their caregivers; another fifteen children in PM-S and three in the CNL-B programme without INE defaulted after admission, giving a total of 111 children who received either peanut/milk-based spreads (PM-S, n=29), cereal/nut/legume-based biscuits (CNL-B, n=44) or the same biscuits supported by intensive nutrition education (CNL-B+INE, n=38) All these children were assessed for anthropometrics and WHZ at admission and discharge, for frequency of reaching WHZ≥-1.5SD (recovery) and for weight gain until recovery/programme closure (Table 2).

At admission, children in the CNL-B groups (with or without INE) were significantly younger, had a corresponding lower mean weight and were more likely to have a more severe condition of wasting (WHZ<-2SD) than those in the PM-S group. WHZ scores at admission were not different between groups whereas children in the CNL-B programmes showed a higher mean WHZ and a higher increase (difference) in WHZ at discharge (p=0.006) than those in the PM-S programme. Weight difference or increment was significantly higher in both of the CNL-B groups in comparison with the PM-S group. Weight gain was highest in the CNL-B+INE followed by the CNL-B and PM-S group and, as a consequence, mean weight at discharge no longer differed between the groups.

Children in CNL-B programmes showed a significantly higher frequency of high compliance (>80%) to the RUF (86% and 84% vs 45%, p<0.001) and were more likely to recover (higher prevalence in WHZ≥-1.5SD) despite the higher prevalence of moderate wasting (<-2SD) at admission, and thus higher mean distance to target WHZ (≥-1.5SD) than those in the PM-S programme. The lower prevalence of moderate wasting may explain the shortest duration of stay until recovery in the PM-S group.

Multivariable logistic regression analysis revealed higher frequency of high compliance (>80%) to the RUF followed by weight gain and a lower degree of wasting at admission but not the type of RUF (spread vs biscuits) as independent predictors of reaching target WHZ≥-1.5SD

Table 2. Characteristics and anthropometric indices of children at admission/discharge in the different nutrition centres providing fortified RUFs in form of PM-S, CNL-B or CNL-B with INE[†]

	PM-S	CNL-B	CNL-B+INE	$p^{‡}$
Number of children (n)	29	44	38	
Age at admission (month)[a]	39.2±14.8	33.4±13.3	30.7±12.3*	0.040
Female (% (n))[b]	34 (10)	43 (19)	42 (16)	0.738
Child still breast-fed	28 (8)	39 (17)	34 (13)	0.623
Weight (kg)				
At admission [c]	10.7 (9.8, 11.6)	9.53 (9.0, 10.0)*	9.46 (9.0, 9.9)*	0.011
At discharge	11.1 (10.2, 12.0)	10.4 (9.8, 11.0)	10.1 (9.6, 10.6)	0.092
Difference	0.39 (0.28, 0.51)	0.73 (0.55, 0.94)*	0.67 (0.56, 0.79)*	0.004
At admission	10.8±2.2	9.6±1.7*	9.5±1.4*	0.006
At discharge	11.2±2.3	10.5±1.9	10.2±1.4	0.064
Difference	0.42±0.29	0.87±0.78*	0.65±0.56	0.010
Height (cm)				
At admission	88.9±10.4	83.7±8.1*	83.2±7.5*	0.014
At discharge	89.2±10.5	84.5±8.3	84.2±7.4	0.036
Difference	0.31±0.54	0.83±1.6	0.99±1.5	0.119
WHZ				
At admission	-1.92±0.37	-1.99±0.36	-1.98±0.38	0.689
At discharge	-1.52±0.48	-1.14±0.66*	-1.39±0.63	0.030
Difference	0.40±0.33	0.85±0.68*	0.59±0.61	0.006
Recovered (WHZ≥-1.5SD)[b]	62 (18)	84 (37)*	79 (30)	0.086
Compliance >80% (yes)	45 (13)	86 (38)**	84 (32)*	<0.001
WHZ adm. <-2SD	21 (6)	39 (17)	45 (17)*	0.114
WHZ distance to -1.5SD	0.34 (0.23, 0.48)	0.42 (0.33, 0.54)	0.40 (0.29, 0.53)	0.601
Staying (days)	25.3 (17.5, 36.5)	32.9 (25.4, 42.6)	29.6 (20.8, 42.6)	0.520
Those recovered (days)	17.7 (11.9, 26.3)	31.9 (23.8, 42.7)	22.2 (15.5, 31.8)	0.057
Weight gain (g/kg/day)	1.01 (0.43, 2.36)	1.76 (1.12, 2.79)	2.31 (1.64, 3.26)	0.112
Those recovered (g/kg/day)	2.34 (1.49, 3.68)	2.52 (1.86, 3.43)	3.01 (2.14, 4.25)	0.602

[†]Data are mean±SD [a], % (n) [b], or geometric mean (95% CI) [c], all such values.
[‡]One-way ANOVA with Bonferroni's multiple comparisons test or Pearson chi-square test (for prevalence); *different to PM-S, $p<0.05$; **different to PM-S, $p<0.001$.
PM-S: Peanut/milk-based spreads program; CNL-B: Cereal/nut/legume-based biscuits program; CNL-B and intensive nutrition education (INE).

Table 3. Predictors of successful recovery (WHZ≥-1.5SD): 85/111 (77%)[†]

	OR	95% CI	*p*
Compliance >80% (yes)	5.68	1.62, 19.9	0.007
Weight gain (g/kg/day)	3.99	1.72, 9.28	0.001
WHZ distance (at admission) to -1.5SD	0.08	0.01, 0.51	0.008

[†]Variables are listed in the order they were entered in the forward model.
OR: odds ratio; *p*: *p*-value.

(Table 3, all $p<0.01$): children who highly complied with the instructions and the consumption of the RUF (either PM-S or CNL-B) were 5.6 times more likely to reach WHZ≥-1.5SD. Each unit increase in weight gain (g/kg/day) increased 4-fold the odds of recovery, whereas higher distance to -1.5 WHZ at admission significantly reduced the likelihood of recovery, indicating that children admitted in a more severe condition of moderate wasting were less likely to reach target WHZ.

Linear regression analysis on weight gain (g/kg/day) showed a positive correlation with the frequency of high compliance to the RUF-supplement (r=0.333, $p<0.001$) with those children reaching WHZ≥-1.5SD (r=0.54, $p<0.001$) and with those receiving biscuits vs. spread (r=0.188, $p=0.051$). As expected, the length of stay in the programme was inversely related to weight gain (Table 4).

DISCUSSION

The results of the supplementary feeding programmes for moderately to mildly wasted children on Nias Island indicate that the long-term acceptance of the food supplement and compliance with the programme are linked to the rate of recovery. Despite the fact that both RUF supplements were tested in a pilot phase and modified accordingly, some of the reservations against the PM-S supplement were deeply rooted in cultural perceptions which could not be resolved during the course of this study. In-depth interviews were performed with the caregivers of defaulter children who mentioned a number of concerns. As local family food consists largely of rice, vegetable sauces (sometimes including fish) and roasted groundnuts (eaten as snacks), the taste of the peanut/milk powder spread was unknown and disliked by many of the caregivers of the concerned children in the study area. The nearby little shops were selling commercially produced biscuits, but nothing with a similar texture to the peanut/milk powder spread was available. As in other remote areas in Indonesia, milk (as a beverage) was not consumed among the villagers, and it was not offered to young children. Apart from the unfamiliar taste of milk powder, it is expensive and, therefore, only better-off families can afford it. As a result,

Table 4. Predictors of weight gain (g/kg/day)[†]

[Ln] weight gain (g/kg/day)	β	95% CI	R	*p*
Compliance >80% (yes)	1.23	0.563, 1.90	0.333	<0.001
Recovered, WHZ ≥ -1.5SD (yes)	2.08	1.46, 2.70	0.540	<0.001
CNL-B or CNL-B+INE vs PM-S	0.685	-0.002, 1.34	0.188	0.051
WHZ admission	0.297	-0.528, -1.12	0.069	0.478
WHZ distance (at adm.) to -1.5SD	-0.297	-1.12, 0.528	-0.069	0.478
WHZ at admission <-2SD (yes)	-0.097	-0.764, 0.541	-0.029	0.764
Length of stay (days)	-0.020	-0.028, -0.013	-0.452	<0.001

[†] Linear regression analysis on log transformed data of weight gain.
β: Beta (regression coefficient); R: Pearson correlation coefficient; *p*: *p*-value.

drinking milk, especially made from full cream milk powder, was not part of daily habitual practices in the study area. Therefore, skimmed milk powder was used in local production of PM-S instead of full cream milk powder whenever it was available. The widely perceived belief that all food has to be cooked before offering it to family members was another concern regarding the consumption of PM-S. Even after these concerns were taken into consideration by heating the palm oil and roasting the peanuts prior to PM-S production, some of the caregivers still treated it as a raw food supplement. On the other hand, some caregivers who did not participate in the local production of PM-S were more likely to give their informed consent for their children's participation. Similarly a study in Cambodia highlighted the fact that acceptability of the standard RUTF is not so much a personal choice of the index children but rather dependent on the decision of the caregivers.[28]

The use of peanut butter/flour as one of the main ingredients of PM-S was also questioned by some caregivers with respect to the perceived risk of developing diarrhea. Although morbidity data collected on a daily basis during the intervention period did not show any significant difference in the occurrence of diarrhea between children consuming PM-S or the CNL-B, the belief regarding a perceived relationship between the consumption of larger amounts of the peanut/milk powder/oil paste and the occurrence of diarrhea still influenced the decision of some caregivers not to allow their children to participate, or to default from the PM-S programme.

The admission of a child into a specific intervention programme did not guarantee that he/she would follow the programme entirely until reaching discharge criterion of WHZ≥-1.5SD. On Nias Island, the influence of male family members especially, fathers and grandfathers, on any decision related to the wellbeing of family members is still very strong. From in-depth interviews during home visits, we found that the decision whether a child could join or remain in the specific programme often relied on the fathers' and/or grandfathers' permission.

At the onset of this study, children admitted in the PM-S programme were significantly older and had a better nutritional status than those admitted in CNL-B programmes. Due to the concerns mentioned above the caregivers of younger children probably hesitated to give their informed consent for participation in this group.

The higher weight gain and shorter duration of stay for children in the CNL-B+INE programme, as well as the fact that no child defaulted from these programmes, is likely to be related to the impact of the intensive nutrition education sessions. This finding is supported by other studies, for example in Zimbabwe,[37] in Nicaragua,[38] and on Nias Island.[7] However, several mothers/caregivers in this study complained about the required daily attendance of approximately one to two hours at the nutrition centres, which conflicted with their daily workload.[19]

Despite ongoing constraints regarding acceptance of PM-S among some caregivers of this study, our data suggests that daily supplementary feeding with locally produced RUFs contributed to improved nutritional status of the index children in the study areas irrespective of the type of food supplement. This is in line with a study conducted in Malawi where RUTF was tested in comparison to fortified soy-based spread among moderately underweight children aged six to 17 months.[39] Additionally, these results are compatible with findings of a more recent study performed in Vietnam where commercially produced RUTF and a locally produced soft bar (made of mung and soy beans, rice, sesame, sugar, milk powder, whey protein, vegetable oil and a premix) resulted in a comparable increase of nutritional status among wasted children aged three to five years.[40] Even severely malnourished children aged two and above seem to obtain an almost equal benefit from milk-free soy-maize-sorghum-based RUTF or standard RUTF, while there seems to be some evidence that those below two years of age may still be more dependent on milk-based RUTFs,[41] most probably when they are no longer being breast fed.

As shown in underweight Malawian children,[42] our findings confirm that compliance with the food supplement and weight gain were main predictors for reaching discharge criteria of target WHZ≥-1.5SD. Therefore, it is important to encourage the consumption of the food supplement for children with low consumption records, especially in cultures where infant/young child feeding is not closely controlled and sharing of the take-home RUF ration is common practice.[43] In this case, supervised feeding sessions should be carried out in the nutrition centre as well as during home visits. In our study, it was also common practice that the leftovers of the assigned daily RUF portion were taken home by the caregivers for later consumption in the afternoon or evening.

Our findings support the results of other studies that supplementary feeding should start as early as possible for effective prevention and treatment of malnourished

children.[44] We also suggest paying more attention to culturally accepted eating habits and compliance issues by particularly including those family members who are involved in child care practices and family decision making processes. In this way, a supportive environment for continued learning in nutrition-related matters for early treatment and prevention of any form of malnutrition is more likely to be created.

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AUTHOR DISCLOSURES

The authors have declared that no competing interests exist.

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Original Article

Locally produced cereal/nut/legume-based biscuits versus peanut/milk-based spread for treatment of moderately to mildly wasted children in daily programmes on Nias Island, Indonesia: an issue of acceptance and compliance?

Veronika Scherbaum MSc, PhD[1,2], Ratna Chrismiari Purwestri MSc, PhD[2,3], Wolfgang Stuetz MSc, PhD[4], Dyah Ayu Inayati MPhil, PhD[1], Julia Suryantan MD, MSc[5], Maurice Alexander Bloem MSc[6], Hans Konrad Biesalski MD, PhD[2]

[1]*Institute for Social Sciences in Agriculture, Department of Gender and Nutrition, University of Hohenheim, Stuttgart, Germany*
[2]*Institute for Biological Chemistry and Nutrition, University of Hohenheim, Stuttgart, Germany*
[3]*Faculty of Medicine, Nutrition Department, University of Brawijaya, Malang, Indonesia*
[4]*Institute of Nutrition, Friedrich-Schiller-University of Jena, Jena, Germany*
[5]*Church World Service Indonesia, Jakarta, Indonesia*
[6]*Church World Service, New York, USA*

本地生产的谷物/坚果/豆科植物为基础的饼干和花生/牛奶为基础的涂抹酱对印度尼西亚尼亚斯岛日常计划中轻中度虚弱儿童治疗的比较：一个接受和依从的问题

背景：强化方便食品对轻中度虚弱儿童的治疗效果在很大程度上是未知的。**方法**：在印度尼西亚尼亚斯岛两种本地生产的方便食品的营养堪比形式对轻中度虚弱儿童（身高别体重 Z-评分/WHZ，-3SD≤WHZ<-1.5SD）日常供餐方案中进行评估。在接受花生/牛奶为基础的涂抹酱治疗的儿童（n=29）、接受谷物/坚果/豆科植物为基础的饼干治疗的儿童（n=44）和第二组接受谷物/坚果/豆科植物为基础的饼干治疗并且其母亲接受营养强化教育（n=38）的儿童中，比较其达到目标 WHZ≥-1.5SD 的频率、对方便食品计划的依从、直到康复或计划结束时的体重增加。**结果**：与花生/牛奶为基础的涂抹酱计划相比，接受谷物/坚果/豆科植物为基础的饼干组的儿童年龄更小（31 和 33 比 39 个月，p=0.04），在参加研究时虽然轻度虚弱者高些（WHZ<-2 分别为：45%和 39%比 21%，p=0.114），但恢复率更高（84%和 79%比 62%，p=0.086），对方便食品的高使用频率（86%和 84%比 45%，p<0.001）其依从性>80%。多因素 logistic 回归分析显示：高依从性，重增加与饼干的消费呈正相关（与花生/牛奶为基础的涂抹酱相比，r=0.188，p=0.051），并且与接受谷物/坚果/豆科植物为基础的饼干和花生/牛奶为基础的涂抹酱组相比，接受谷物/坚果/豆科植物为基础的饼干加上营养教育组的体重增加最高。**结论**：本地生产的方便食品饼干或涂抹酱在轻中度虚弱儿童的恢复中效果相似。

关键词：强化的方便食品、补充喂养、轻中度虚弱儿童、体重增加、项目依从性