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Promoting dietary diversity to improve child growth in less-resourced rural settings in Uganda

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Abstract

Background: Analyses of global trends indicate that childhood undernutrition is more prevalent in rural areas, and also that maternal education and decision-making power are among the key factors significantly associated with child growth.

Methods: The present study comprised a controlled longitudinal study aiming to assess the effectiveness of nutrition education with respect to improving growth patterns of young children of less-literate, low income caregivers in a rural subsistence farming community. Caregivers in the intervention group ($n = 52$) attended a structured nutrition education programme, whereas the control group ($n = 45$) participated in sewing classes. Weights and lengths/heights were measured for children in the intervention and control groups every month for 1 year to assess changes in growth patterns. Repeated measures analysis of covariance was used to access differences between the two groups over time and across age groups. Variability in growth patterns of individual children and clustering of caregiver effects were controlled for during the statistical analysis.

Results: After 12 months, children in the intervention group had significant improvements in weight-for-age compared to the controls [mean (SD): 0.61 (0.15) versus −0.99 (0.16), $P = 0.038$]. Changes in height-for-age, weight-for-height and mid-upper arm circumference-for-age showed a positive trend for children in the intervention group. Changes in weight-for-height were statistically significant across age groups and negatively related to caregiver's age.

Conclusions: Educating caregivers has the potential to improve young children's nutritional status and growth, especially among less literate populations where households subsist on what they produce.

Introduction

Reducing hunger and under-five mortality are among the central themes of the United Nations millennium development goals (UN, 2005); however, malnutrition remains a global problem as a result of the multifaceted nature of its causes. An analysis of global trends with respect to differences in levels of malnutrition indicates that both stunting (an indicator for chronic undernutrition) and wasting (an indicator of acute undernutrition) are more prevalent in rural areas (Smith *et al.*, 2004). These differences appear to be more pronounced in Sub-Saharan Africa and South East Asia, which are the two regions with the largest proportion of malnourished children. Although the causes of the high levels of malnutrition among children in rural areas are diverse, children's linear growth (indicated by height-for-age) is associated with socio-economic factors (Shen *et al.*, 1996), and maternal education and decision-making power are among the key factors significantly associated with child growth (Smith *et al.*, 2004).

In general, most studies investigating the links between maternal education and child growth in developing countries show that children of mothers that have attained some formal education have a reduced risk for poor growth and mortality (Cochrane *et al.*, 1982; Cleland & van Ginneken, 1988; Visaria *et al.*, 1997; Wamani *et al.*, 2004; Moestue & Huttly, 2008). Although maternal education has been found to have more influence on household income and decision-making processes, maternal education (both formal and informal) is also associated with improvements in feeding practices and childcare (Hoorweg & McDowell, 1979; Weaver, 1984; Guldan *et al.*, 1993; Parvanta *et al.*, 1997; Hotz & Gibson, 2005).

The present study aimed to determine whether nutrition education targeting the food selection practices of caregivers in rural areas (subsistence farmers) would improve child-feeding practices among rural caregivers and, consequently, lead to improvements in the quality of diets and growth patterns of their young children. Figure 1 shows the conceptual framework that guided the design of this intervention. It was hypothesised that less literate and low-income caregivers who are exposed to this intervention will improve their food knowledge, attitudes towards foods and feeding children, food selection and preparation practices, and meal planning skills. These changes were further expected to result in improved children's diets, nutritional status and growth patterns. The effects of this nutrition education programme on children's dietary intake and micronutrient nutriture are discussed elsewhere (Kabahenda *et al.*, 2011). This present study discusses the effects of this nutrition education intervention model on children's growth patterns.

Materials and methods

Study participants

Multistage sampling procedures were used to recruit study participants from two rural communities in Kabarole district, western Uganda. The first stage involved purposively selecting two rural areas with approximately similar socio-demographic characteristics and cropping patterns to serve as study sites (control and intervention sites). The second stage involved listing all households with children aged between 6 and 48 months in the selected study sites and then using a sampling interval to randomly select 246 caregivers (118 from intervention and 128 from the control site) who were engaged in a baseline study. The third and final stage involved the selection of 100 child-caregivers dyads (50 from each site) to engage in the intervention study. Because caregivers were coming from different directions and joined the queue as they arrived at the assessment site, investigators selected intervention participants by selecting the first

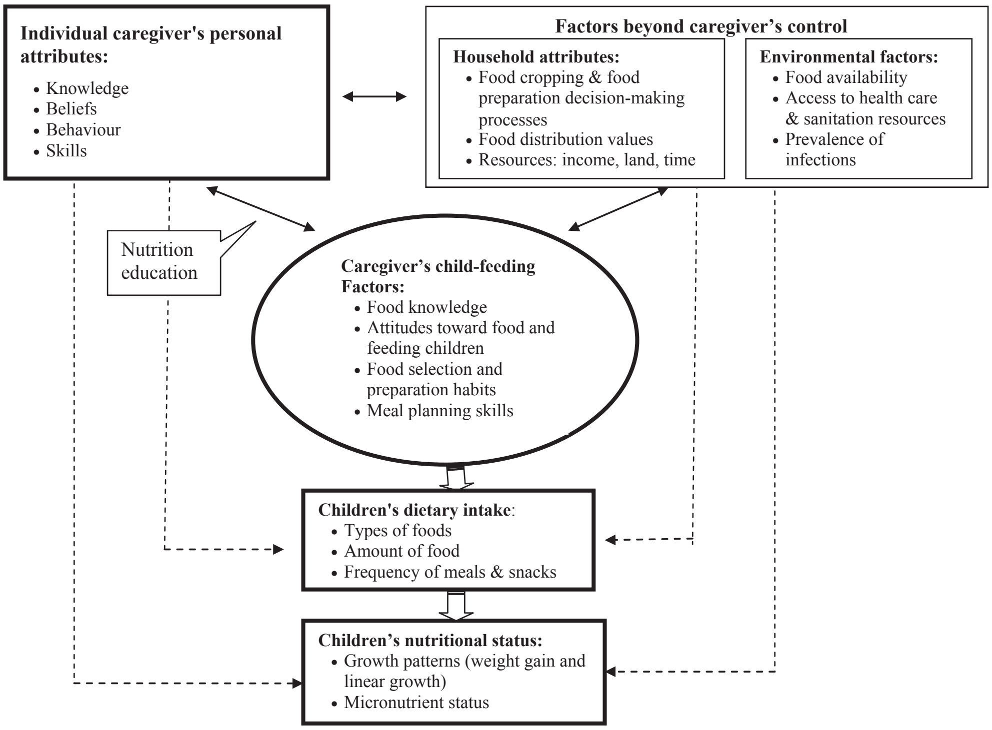

Figure 1 Conceptual model for influencing caregiver child-feeding behaviours to improve child growth.

participant in line and skipped every other person. In case the selected caregiver did not agree to engage in the intervention or to bring her children for growth monitoring every month, then the next person in line was selected. A total of 110 children (61 intervention and 49 controls) participated in this study component.

Study design

This study comprised a controlled interventional trial that lasted 1 year. A baseline assessment was conducted to assess caregivers' feeding practices and children's nutritional status. This was followed by an intervention where caregivers in the intervention group attended a nine-session nutrition education programme that lasted 5 weeks and their children were measured every month for a period of 1 year to assess changes in growth patterns. A control group of caregivers participated in sewing classes and their children's growth was also monitored for 1 year.

Structure of the intervention model

This was a structured nutrition education programme designed to provide caregivers with skills to select and prepare a variety of foods to improve the quality of young children's diets. Table 1 provides an outline of the curriculum used for this intervention. Each cooking class comprised a lecture session that lasted 45–60 min and demonstration session that lasted 3–5 h. All sessions were facilitated by local educators who were selected from the study communities.

The structure and content of the curriculum was informed by findings of focus group discussions and a

Table 1 Outline of intervention curriculum

Session	Learner objectives
Selecting and preparing a variety of foods from the three food groups	Acknowledge diversity of local foods Correctly classify foods to appropriate food groups Identify foods lacking/abundant in their children's diets Prepare a meal that incorporates foods from all food groups
Choosing and preparing body-building foods – plant sources	Identify protein-rich plant source foods that are appropriate for children Demonstrate creative ways to make nuts, beans, and other legumes enjoyable for children Plan meals that incorporate at least two servings of protein rich foods each day Complement legumes with cereals to improve protein quality
Choosing and preparing body-building foods – animal sources	Identify animal source foods (ASF) as richest protein source Identify which ASF are appropriate for children Identify and prepare low-cost meats for young children Be familiar with recommended amounts and servings of ASF for young children
Choosing and preparing energy-yielding foods	Identify starchy foods appropriate for young children Substitute or complement bananas with other nutrient dense starchy foods on regular basis Provide children with at least five servings of energy-yielding foods daily
Choosing and preparing energy-yielding foods – fats, oils and sweets (FOS)	Identify which FOS are appropriate for children Understand importance of providing moderate amounts of FOS to growing children Recognise fruits as best source of sugars Appropriately incorporate fats, oils, and sugars in young children's diets
Choosing and preparing protective foods – vegetables	Understand that vegetables are an important component of a balanced diet Identify which vegetables are appropriate for children Know recommended amounts and number of servings needed by children Prepare meals that incorporate a variety of vegetables
Choosing and preparing protective foods – fruits	Understand that fruits are an essential component of children's diets Identify which fruits are appropriate for young children State recommended number of servings and amounts for children Prepare and serve a variety of fruits
Planning meals for young children: food variety and meal quality	Understand that young children have higher needs for nutrients than adults Improve meal planning skills Prepare meals that incorporate foods from all three food groups Plan and prepare snacks for children
Planning meals for young children: meal frequency and food portions	Improve the quality of meals prepared for children Make meals visually attractive to young children Prepare and serve adequate amounts of food from all food groups to young children

Incorporate = select, cook or prepare and serve.
ASF, animal source foods; FOS, fats, oils and sweets.

pilot study conducted with women similar to caregivers targeted in this intervention. The major theme for this intervention was to improve the adequacy of children's diets through providing caregivers with skills to select and prepare a variety of foods from all food groups regularly. This theme was chosen because the available literature indicate that a limited variety of foods were provided to young children in Uganda (Rutishauser & Frood, 1973). Research also shows that diets including a variety of foods tend to be adequate in most nutrients (Krebs-Smith *et al.*, 1987; Heber & Bowerman, 2001; Kennedy *et al.*, 2007; Arimond *et al.*, 2010). Hence, cooking classes focused on teaching mothers simple food selection and preparation skills that encourage food variety. An emphasis was placed on improving the traditional food preparation techniques.

Using a specially designed food guide plate that highlighted the diversity of locally available foods, caregivers were also motivated to adopt appropriate meal planning skills to ensure that young children were fed frequently and given adequate amounts of food from the three food groups (Fig. 2). To improve comprehension and to ensure that participants select a wide variety of foods, each food group was further sub-divided into easily recognisable subgroups, as shown in Table 2. A total of 21 talk boards were specially designed to communicate the concepts of variety, adequacy and proportionality. For example, the concepts of food variety and proportionality were communicated to intervention participants using a food guide plate, which was designed with input from local community educators (Fig. 2a). The concept of an inadequate diet was demonstrated using a partially empty plate (Fig. 2b) to emphasise the fact that, where foods from some groups are missing, then the child's diet is incomplete. To further illustrate the importance of having variety within each food group, some graphics were designed with some food sub-categories missing (Fig. 2c).

Table 2 Classification of foods into subgroups

Energy-yielding foods	Body-building foods	Protective foods
Banana	Legumes	Fruits
Tubers and starchy vegetables	Nuts	Vegetables
Grains	Meats (all types plus eggs)	
Fats, oils and sweets	Milk	

In addition to talk boards, models of actual foods were always used because the graphics did not include all locally available foods. The food models were used to help participants learn to identify and group foods into their appropriate main groups and subgroups. In line with the theory of experiential learning, during each learning segment, participants were engaged in cooking sessions where they practiced planning different meals based on what was covered in that day's lecture session. A supportive learning environment was assured by providing the participants with a variety of food items, charcoal and firewood, cooking utensils, and serving utensils. The educator ensured that all participants had adequate utensils and ingredients to prepare the assigned meals and, where there were shortages, the educator gave suggestions on how to improvise and took note of the shortages.

To improve individual engagement in the learning process, participants were divided into small teams of five or six people each. Each team was assigned a meal and caregivers decided on the types and amounts of ingredients they used to prepare the assigned meal. At the end of each cooking session, each team was required to serve a meal for a 3-year-old child. Each team's meal was evaluated by peers, the educator and the principal investigator. The meals served helped the educator to evaluate whether the lesson objectives had been met and also provided an opportunity to emphasise important concepts that were not deeply explored in the lecture sessions.

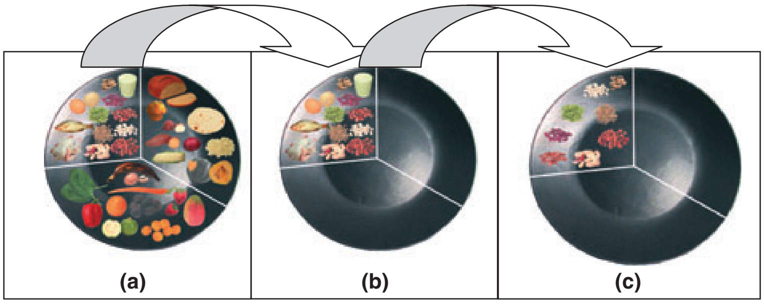

Figure 2 Food guide used to communicate concepts of variety and proportionality. (a) Food plate used to coach caregivers on food selection. This full plate emphasises that a balanced diet is constituted by food from all three food groups. (b) Food plate with a portion of protein source foods only. Shows that a child's diet is not complete when the other food groups are missing. Hence, food from all three groups are needed. (c) Shows only locally available protein-rich plant source foods. It highlights the need for including animal source foods to complete this portion of a child's diet.

In addition to the team cooking sessions, a common meal (lunch) was always prepared to mimic usual household meal preparation. This meal was large enough for all the 42 participants and was always designed to emphasise the key concepts covered in the day's lesson and to introduce unfamiliar foods to participants. The common meal also helped to put the programme concepts in perspective of an average caregiver who is accustomed to preparing meals for large families. For example, during the lesson on *Plant protein sources*, caregivers were provided with a variety of indigenous legumes and grains, and the meals that were assigned to groups on that day included bean-rice pilaf, maize-meal-groundnut paste porridge, and refried bean sauce thickened with wheat flour. Because most caregivers had indicated that they had never tasted cooked soybeans, a common pot of steamed maize meal complemented with soybean-groundnut sauce was prepared for lunch. Steamed pumpkin and sweet potatoes were added to emphasise the need for variety within the *Energy-yielding food group* because this topic had already been covered.

Growth monitoring

Children's weights and heights or lengths were assessed at baseline and during the second week of each month for a period of 1 year. In addition, mid-upper arm circumference (MUAC) was assessed at baseline and 1 year from baseline. These assessments were always conducted on two consecutive days. Weights were assessed using a hanging scale and recorded to the nearest 10 g. Heights were taken from children 24 months and older with a standiometer, whereas children under 24 months of age were measured recumbent with a Seca 210 measuring mat (Vogel & Halke GmbH & Co, Hamburg, Germany). Both lengths and heights were recorded to the nearest 0.1 cm. Seca measuring tapes (de Pee & Bloem, 2001) were used to assess MUAC and data were recorded to the nearest 0.1 cm.

In addition, Seca 405 growth charts (red for girls and blue for boys) were used to plot weight-for-age for children under 36 months of age, whereas Seca 406B and Seca 406G growth charts were used to plot weights and heights for boys and girls aged 36–59 months, respectively. The information plotted on each child's growth chart was clearly explained to the caregiver and, where necessary, caregivers were guided on what action to take.

Statistical analysis

Anthropometric data were collected every month but, as a result of poor attendance at the monthly growth assessments, anthropometric data are reported for 2-month averages. EPI INFO, version 3.2.2 (Center for Disease control and Prevention, Atlanta, GA, USA) was used to compute height-for-age (HAZ), weight-for-age (WAZ), weight-for-height (WHZ) and MUAC-for-age (MUAZ) *Z*-scores using the median of the National Center for Health Statistics (NCHS)/World Health Organization (WHO) reference population. After removing the data for children whose ages could not be verified and the records flagged by Epi Info, 102 children were included in the analysis. Data were analysed using SAS PROC MIXED, version 9.1 (SAS Institiute, Cary, NC, USA). Ignorability of missing data was examined using mixed effects selection models that quantified the association between missingness and observed data (Fitzmaurice *et al.*, 2004; Hedeker & Gibbons, 2006).

After determining that the missing data could be ignored without affecting the results, children's baseline age was used to classify children into four groups: <12 months, 12–23.9 months, 24–35.9 months and 36–47 months. Available data were analysed using repeated measures analysis of covariance (ANCOVA) using baseline age group as the covariate and WAZ, HAZ, WHZ and MUACZ as the response variables. Given that some caregivers had multiple children, a linear mixed-effect model (version of repeated measures ANCOVA) was employed to account for caregiver-specific random effects, such as breastfeeding status, age and level of education. The model also controlled for child-specific random effects likely to result from the variability in the growth patterns of individual children, such as age, immunisation status and breastfeeding status. Pearson partial correlations were conducted to assess relationships among changes in dietary factors (food variety, diet adequacy and feeding frequency) and growth indicators (WAZ, HAZ, WHZ and MUAZ) controlling for baseline nutritional status. For all analyses, an alpha level of ≤ 0.05 was used to determine statistical significance.

Results

In general, the results obtained in the present study indicate that nutrition education has the potential to improve the dietary intake and nutritional status of young children of less literate, low-income rural caregivers. Below, we report how nutrition education improved the growth patterns among children aged 6–48 months. Details on changes in caregivers' knowledge, beliefs and feeding practices, as well as the changes in their children's micronutrient nutriture, are provided elsewhere (Kabahenda *et al.*, 2011).

Characteristics of study participants

A total of 89 caregivers participated in the study and almost all caregivers had one child, eight (9.0%) had two children and only one woman (1.1%) had three children.

The children (n = 102) engaged in the present study were all healthy (determined by clinical examination and caregiver's self reports); aged between 6 and 43 months at baseline (mean age = 22.4 months); and comprised 47% females and 53% males. The mean age of caregivers was 29.6 years (range 17–60) and the majority of the caregivers were subsistence farmers (94.6%), had limited literacy (average grade completed was primary two) and approximately 85% lived in households with a total gross income <US$28 per month. The two sites did not have statistically significant differences in children's ages and sex, nor in caregivers' ages, occupations, and the level of formal education attained.

Changes in children's growth patterns

Height-for-age

Low HAZ indicates impairment in linear growth or stunting and is often caused by chronic undernutrition or poor health. Baseline incidence of stunting (−2 SD below the NCHS median) was 25.5% and 38.3% in the intervention and control groups, respectively, whereas the proportion of children at risk for stunting (−2 to −1.01 SD) was 40.0% and 27.7%, respectively (Table 3). Mean (SD) baseline HAZ was slightly higher in the intervention group compared to the controls [−1.43 (0.17) versus −1.56 (0.17)]; however, the difference was not statistically significant. There were no significant differences in changes in HAZ between the intervention and control groups over time (P = 0.401) and across age groups (P = 0.973). The intervention group maintained their HAZ, whereas the controls experienced some growth faltering beginning April/May (Fig. 3). Changes in HAZ were related to child's sex where girls experienced a mean increase of 0.588 in HAZ over boys (P = 0.009).

Weight-for-age

Both sites had a high proportion of children who were underweight and at risk for being underweight. Baseline incidence of being underweight was 14.5% and 19.1% in the intervention and control groups, respectively. Children in the intervention group significantly improved with respect to WAZ over time compared to the controls ($F_{1,85}$ = 2.15, P = 0.038). Mean (SD) WAZ from baseline to end of intervention improved among children in the intervention group [−0.84 (0.15) to −0.61 (0.15)] but declined among the controls [−0.77 (0.16) to −0.99 (0.16)]. In general, girls had better WAZ than boys but, at end of the intervention, these sex differentials were only statistically significant among children whose caregivers attended the nutrition education programme [$F_{1,45}$ = 7.95, P = 0.007; mean (SD) for girls −0.41 (1.05) versus mean −1.21 (0.84) for boys]. Overall, changes in

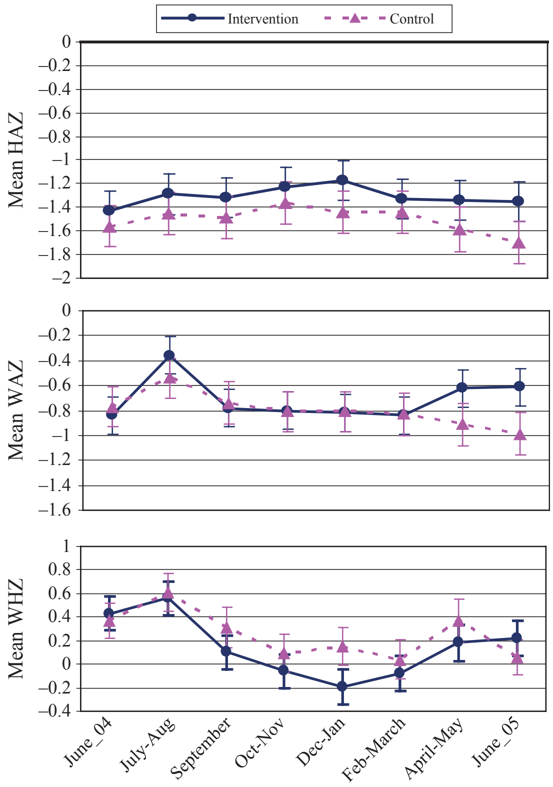

Figure 3 Mean changes in children's height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) Z-scores.

Table 3 Incidence of stunting, underweight, wasting at baseline and at 9 months after intervention

Growth indicators	Baseline Intervention (n = 55)	Baseline Control (n = 47)	End Intervention (n = 45)	End Control (n = 38)
Height-for-age				
Stunted*	25.5 (14)	28.3 (18)	24.4 (11)	34.2 (13)
At risk for stunting†	40.0 (22)	27.7 (13)	35.6 (16)	34.2 (13)
Weight-for-age				
Underweight*	14.5 (8)	19.1 (9)	8.7 (4)	7.9 (3)
At risk for underweight†	36.4 (20)	23.4 (11)	34.8 (16)	36.8 (14)
Weight-for-height				
Wasted*	0	0	2.2 (1)	0
At risk for wasting†	14.5 (8)	10.6 (5)	11.1 (5)	10.5 (4)
MUAC-for-age				
Low MUAC*	23.6 (13)	15.2 (7)	10.9 (5)	11.1 (4)
At risk for low MUAC†	40.0 (22)	41.3 (19)	39.1 (18)	41.7 (15)

Unless indicated, all numbers are % (n).
*Less than 2 SD below median for NCHS/WHO reference population.
†−2 to −1.01 SD below median for NCHS/WHO reference population.
MUAC, mid-upper arm circumference.

WAZ over time were negatively related to caregivers' age. For every unit increase in caregiver's age, WAZ declined by 0.025 ($P = 0.012$). Figure 3 shows the mean changes in WAZ over time.

Weight-for-height

Low WHZ indicates wasting. The proportion of wasted children was low (<5%) in both groups. Mean (SD) baseline and end of intervention WHZ *Z*-scores were 0.04 (0.14) and 0.22 (0.15) for the intervention group and 0.37 (0.15) and 0.06 (0.15) for the control group. There were no significant differences in WHZ for the two treatment groups over time ($P = 0.135$) and the differences in WHZ were not associated with child's sex.

Changes in WHZ were statistically significant across age groups ($F_{3,92} = 3.60$, $P = 0.018$). Children in the youngest age group (6–12 months) had the greatest improvement in WHZ. WHZ was also negatively related to caregiver's age. For every unit increase in caregiver's age, children's WHZ decreased by 0.017 ($P = 0.048$). Figure 3 shows mean WHZ for the two groups over time.

Mid-upper arm circumference-for-age

MUAZ is a good indicator of nutrition and health status; and low MUAC is also an independent predictor of risk for mortality. At baseline, more children in the intervention had low MUAC-for-age (<2 SD of NCHS/WHO reference population) compared to the control group (23.6% and 15.2%, respectively). Change in MUAC-for-age over time was not significantly different between the two treatment groups ($P = 0.378$) and across age groups ($P = 0.286$). However, both the intervention and control group had slightly improved mean MUAZ (-1.27 to -0.91 versus -1.22 to -0.99, respectively). In both groups, girls had better MUAC-for-age than boys but the differences were not statistically significant.

Discussion

When the incidence of low WHZ is low (<5%), as was the case in the present study, WAZ reflects long-term health and nutritional status (de Onis, 2001). Hence, the significant change in WAZ observed in the intervention group indicates that this nutrition education programme was effective in improving children's nutritional status and growth. As shown in Fig. 3, the improvements in growth patterns of children in both the intervention and control groups appear to have been negatively influenced by other factors not addressed by this intervention. For example, WAZ and WHZ dropped off in both groups from September to around February. This period covers the major rainfall season, which tends to coincide with peak malaria infections (Odongo-Aginya *et al.*, 2005; Zhou *et al.*, 2005). September to December is also a period of food shortage in western Uganda, whereas August to September and February to March are major planting seasons. These difficult periods are followed by the millet harvest season, which falls from late December until January and this is also a labour intensive activity and is likely to affect child care activities. Future studies need to investigate the influence of these factors on childcare practices at household or individual caregiver level.

Low HAZ (stunting) is known to decline around 3 years of age (de Onis, 2001). In the present study, many children were classified as stunted but baseline age group did not predict risk for stunting. This suggests that all children were at risk for stunting. On the other hand, changes in linear growth patterns indicated by HAZ were related to the sex of the child, where girls had significant improvement in HAZ compared to boys. The available data are not adequate to explain the sex-based differences in HAZ; nevertheless sex differences in growth have been reported in other studies (Leonard *et al.*, 1995; Hop *et al.*, 1997; Wamani *et al.*, 2004, 2005). For example, a longitudinal study of children in a deprived environment in Zimbabwe examined children up to 30 months and documented greater deficits in weight among boys (2.3 kg versus 2 kg) but higher deficits in height among girls (8 cm versus 9 cm) (Leonard *et al.*, 1995). In the present study, girls in both intervention and control groups had better growth patterns indicated for all anthropometric measures (HAZ, WAZ, WHZ and MUAZ) than boys. Statistically significant sex differences in growth patterns were also noted in changes in WAZ among children in the intervention group. In general, boys are heavily affected by both malnutrition and infections, which accounts for the low anthropometric values. A review of demographic surveys conducted in Sub-Saharan Africa indicates that the high prevalence of malnutrition among boys could be a physiological factor rather than an effect of sex-based preferences in seeking care and feeding practices (Garenne, 2003).

In general, caregiver's age was a strong predictor of improvement in WAZ and WHZ. Children of older caregivers were more likely to have low WAZ and low WHZ. A similar pattern was also documented in central Uganda where it was observed that the high risk of malnutrition among children of older caregivers could be a result of prolonged breastfeeding (Kikafunda *et al.*, 1998a). The current study recommends the need for in-depth investigations aiming to improve understanding of the negative associations between caregiver's age and child growth patterns.

Overall, the effects of the intervention on child growth were below expectation. Possible effects of nutrition education on child growth could have been confounded by growth monitoring and other programmes that were availed to the control group in the course of the present study. It is important to note that both children in the intervention and control groups participated in monthly growth monitoring activities. However, growth monitoring by itself is an intervention that is valued by mothers and has been shown to improve growth (Coulibaly *et al.*, 2002; Qazi *et al.*, 2003). It is possible that the control group benefited from growth monitoring because they were told that the monthly assessments were necessary to monitor their children's health status. Caregivers in the control group also received advice whenever they sought it and were referred to the government hospital when the child's health was a concern to the investigators. Hence, these services could have improved growth patterns among children in the control group.

Conclusions

The present study demonstrates that a culturally appropriate nutrition education programme can improve the feeding practices of rural caregivers and lead to positive changes in child growth. Because the number of malnourished children in Sub-Saharan Africa is expected to increase, there is need for more interventions to encourage caregivers to provide appropriate meals using locally available food resources. Encouraging the consumption of indigenous foods is particularly appropriate when dealing with rural communities where households mostly subsist on what they produce and women (who are the major caregivers) are also the food producers. Compared to other costly interventions, such as supplementation programmes, this type of nutrition education intervention is inexpensive and can easily be adapted to other contexts. Given that undernutrition tends to cluster among low income groups, this intervention has potential to improve child growth in developing countries because it does not require a family that may already be financially constrained to significantly alter their eating patterns to accommodate the needs of young children. Future research needs to test the effectiveness of this intervention among populations with different food cropping patterns.

Conflicts of interest, sources of funding and authorship

The authors declare that there are no conflicts of interest.
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MKK engaged in concept development, coordination of research activities and fieldwork, data analysis and interpretation. ELA provided technical oversight on diet guidance and dietary assessment tools. CK was involved in needs assessment and reviewing gender components of the research. SYN was involved in concept development and interpretation of the results. RMM had overall project oversight and was engaged in concept development, data analysis and interpretation. All authors were engaged in drafting and reviewing the manuscript and approved the final version submitted for publication.

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