

Nutritional status, complementary feeding practices and feasible strategies to promote nutrition in returnee children aged 6-23 months in northern Uganda

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Abstract

Objectives: The aim of this study was to assess the prevalence of underweight and wasting, feeding patterns, water use and sanitation patterns in children aged 6-23 months in returnee villages in northern Uganda, and then to identify feasible strategies to promote nutrition. Perceived understanding of the presentation and causes of undernutrition was also assessed.

Design: This was a descriptive cross-sectional survey, carried out in May and June 2010.

Setting and subjects: The study was conducted in the districts of Agago and Pader in northern Uganda in 219 children aged 6-23 months.

Outcome measures: Weight and mid-upper-arm circumference were determined for underweight and wasting, respectively. Focus group discussions were held with adults to determine perceived understanding, presentation and causes of undernutrition.

Results: Over 11% of the children were wasted. Those aged 6-11 months were the most wasted. Eighteen per cent of them were underweight. Those aged 12-17 months had the highest prevalence of underweight. Eighty-three per cent of the children were still breastfeeding and 47% were exclusively breastfed. The largest proportion (38.8%) of children ate twice daily and 4.1% had not eaten any food on the day prior to the visit. The water usage rate was 13.3 litres/person/day. The majority (57.5%) of households did not have their own pit latrines and disposed of faeces in the bush (87%). Communities had good knowledge of causes of undernutrition, its consequences and the required practices to prevent and control it.

Conclusion: This assessment has informed the need for holistic approaches to address the challenge of undernutrition in children aged 6-23 months in returnee villages in northern Uganda. Interventions that target improvement in complementary feeding, particularly between the ages of 6-11 months, while also addressing pertinent issues of water and sanitation, hold the most potential to address the challenge.

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Introduction

Given the political instability in northern Uganda that lasted for 25 years, most children were born and raised in camps for internally displaced persons (IDPs). There were associated challenges of people returning to their original villages following the cessation of the fighting between the government and the rebels in 2008. In the IDP camps, mothers and their children lived on the relief foods provided by donor agencies, such as the United Nations Children's Fund (UNICEF) and the World Food Programme.¹ Health services were in close proximity to the population.² It was anticipated that with the return of the population to their ancestral villages and the relief agencies withdrawing from the region, food relief programmes and health services would be nonexistent. It was likely that this would compromise the dietary intake and health care of children under two years of age, in particular, leading to poor nutritional status. In 2006,

only 7.4% of children under five years of age in northern Uganda met the recommended infant and young child feeding practices.³ By 2008, 38.8% of the children in the region commenced complementary feeding before the age of six months, 48.7% at six months and 12.5% after six months.⁴ The levels of undernutrition in children in this region (40% stunting, 21.8% underweight and 6.5% wasting) were higher than than the national averages of 38.1%, 15.9% and 6.1% for stunting, underweight and wasting, respectively.³

Childhood undernutrition that manifests as linear and ponderal growth faltering most commonly occurs during the first two years of life.^{5,6} Children in developing countries are most vulnerable to growth faltering in the period when complementary foods are initiated as this often coincides with decreased breast milk consumption,⁷ increased micronutrient deficiencies and diarrhoeal illness.⁸ Inappropriate care and feeding are recognised as some of the underlying causes of

undernutrition.⁹ Lack of knowledge of optimal feeding practices and cultural beliefs, in particular, contribute to deteriorations in the nutritional status of children.¹⁰⁻¹² Common inappropriate complementary feeding practices include introducing foods too early or too late, offering a limited diversity of foods and providing an inadequate quantity of food.^{13,14} Thus, interventions that focus on changing the behaviours of caregivers and other context-specific factors could greatly improve complementary feeding.¹⁵⁻¹⁸

The aim of this study was to assess the prevalence of underweight and wasting, feeding patterns, water use and sanitation patterns, and identify feasible strategies to promote nutrition in children aged 6-23 months in returnee villages in northern Uganda. Perceived understanding of the presentation and causes of undernutrition was also assessed.

Method

Target population

The target population included children aged 6-23 months and their mothers and fathers.

Study design

This was a descriptive cross-sectional survey, carried out in May and June 2010.

Study coverage

Coverage included the following subcounties: Lira-Palwo, Parabong, Lukole, Kalongo Town Council, Omot, Paimol, Lapono, Omot, Paimol, Omiya Pachwa, Arum and Kotomor in the Agago District, and Puranga, Acholibur, Latanya, Laguti, Kilak and Pader Town Council in the Pader District.

Sample size calculation and sampling procedures

A two-stage cluster sampling methodology following probability proportional sampling² was used. Emergency Nutrition Assessment (ENA) for Systematic Measurements and Relief Transitions software was used to determine the sample size for children. The 2002 Census Uganda results were used as the basis for the population data and the district prevalence of malnutrition¹ was used during the calculation of the sample sizes. Thirty-six clusters were selected from 16 targeted subcounties. Ten households were randomly selected from each cluster (village). A total of 360 households and 482 children aged 6-59 months were selected for the survey. However, for this paper, data for 219 children aged 6-23 months were used. Half of the clusters (18) were randomly selected for 18 focus group discussions with the children's mothers and fathers.

Data collection

The collected data included age in months, sex, weight, mid-upper-arm circumference (MUAC), the presence or absence of bilateral oedema, and information on morbidity, complementary feeding methods, water and sanitation, immunisation, vitamin A supplementation and deworming of the children.

Weight

Weight was measured using a digital Seca scale according to World Health Organization (WHO) standards. The final weight was recorded to the nearest 0.1 kg.¹⁹ The height of the children was not measured as recent studies have confirmed a close relationship between MUAC and wasting.^{5,20}

Mid-upper-arm circumference

Standard MUAC tapes provided by UNICEF were used to determine the MUAC of the children. The final reading was recorded to the nearest 0.1 cm. The distance between the tip of the shoulder bone and elbow was obtained with the arm bent 90 degrees to the chest. The half distance of the upper arm was obtained to determine the mid-upper arm. The distance around the mid-upper arm was measured by placing the tape around it.

Bilateral oedema

Thumb pressure was applied to both the feet of the child and released. Thereafter, three seconds were counted, and if a skin depression remained on both feet, a child was noted to have oedema.

Morbidity

Recent episodes of illness in the children were recorded retrospectively by asking the mothers about illnesses in the fortnight prior to the assessment.

Complementary feeding

The length of exclusive breastfeeding, duration of breastfeeding and care during feeding were recorded.

Water, hygiene and sanitation

Information on the household source of water, water accessibility, daily water usage and availability of latrines was obtained.

Immunisation and supplementation

Information on vitamin A supplementation, and measles and diphtheria, pertussis and tetanus (DPT3) vaccination coverage and deworming over the previous six months were determined from mothers' recall and child health cards.

Data collection tools

The data were collected using a nutritional status appraisal form, health questionnaire and focus group discussion guide. The guide was written in English, translated into Acholi (the local language) and then translated back into English.

Data analysis

ENA[®] (May 2010 version) and WHO Anthropac[®] (June 2010 version) software packages were used to determine the nutritional status of the children. MUAC was used to determine wasting in the children using four cut-off points: < 11.5 cm (severe wasting), 11.5-12.5 cm (moderate wasting), 12.6-13.5 cm (at risk of wasting) and \geq 13.5 cm (normal). Underweight was determined using weight-for-age z-scores using cut-offs: < -2 z-score and \geq -3 (moderate underweight), and < -3 (severely underweight). Final analysis of

the data was carried out using percentage, absolute numbers for categorical variables and regression in IBM SPSS® 19.0 (2011). Binary logistic regression was used to determine the relationship between undernutrition and other variables (feeding, illness, sanitation, sex and age). All statistics were considered to be significant at p -value < 0.05 . Qualitative data from recorded focus group discussions were transcribed, translated and cleaned. The cleaned data were merged and coded into themes. Data coding and analysis was performed using the Atlas.ti® computer software for Windows.

Ethical considerations

Consent to participate in the assessment was sought from the household head. Through the Lutheran World Federation office, clearance to undertake the survey was sought from the district local authority in Pader.

Results

Findings from quantitative data analysis

Sex and age distribution of children aged 6-23 months

The sex and age distributions of the children are shown in Table I. There was an equal representation of boys and girls in the assessed sample.

Prevalence of wasting and underweight

Table II presents the prevalence of wasting and underweight in the children in the returnee villages. The data indicated that only 2 (0.9%) of the children had oedema and that more boys than girls were underweight. From binary regression analysis, boys were 2.7 (95% confidence interval: 1.3-5.6) times more likely to be underweight than girls.

Immunisation, vitamin A supplementation and deworming coverage

Results indicated 78.2% and 88.1% of the children had received measles and DPT3 vaccines, respectively. There were also high vitamin A supplementation (88.1%) and deworming (68.2%) rates. No significant association existed between immunisation, vitamin A supplementation or deworming with undernutrition in children.

Prevalence of common childhood illnesses

Malaria and fever were the most common illnesses (56%), closely followed by diarrhoea (17%) and coughing (4%). Older children

(18-23 months) were mostly affected by illnesses. No significant association existed between childhood illness and undernutrition.

Complementary feeding practices

The results shown in Figure 1 and Table III indicate that the majority of the children were still breastfeeding. Almost half (47%) of the children were exclusively breastfed until the age of six months of age (mean length of breastfeeding 5.2 ± 1.4 months). The most common foods offered to children before six months were water, cereal, traditional medicine and dry tea. The dietary diversity score was low. There was an average intake of three food groups/day/child. The mean number of times the children consumed food was 2.2 ± 1 time/day. Over half of the children consumed food from their own plates, without sharing.

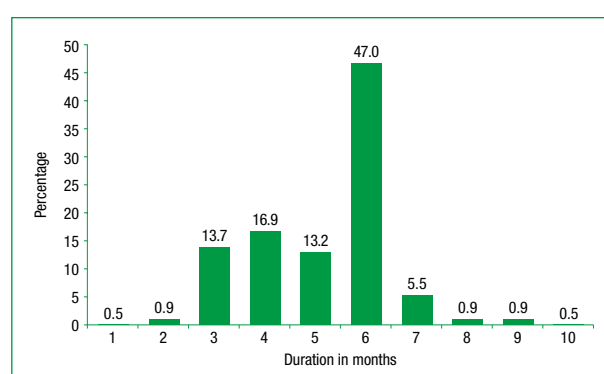


Figure 1: Duration of exclusive breastfeeding

Table II: Prevalence of wasting and underweight in children aged 6-23 months

Nutritional status	Sex			Age category (months)		
	All	Boys	Girls	6-11	12-17	18-23
	%	%	%	%	%	%
Wasting						
Normal	67.6	70.6	64.5	53.5	63.4	84.4
At risk	21.5	18.3	24.5	31.0	21.1	13.0
Moderate	8.7	7.3	10.0	14.1	12.7	0
Severe	2.3	3.7	0.9	1.4	2.8	2.6
Underweight						
Normal	82.2	75.2	89.1	87.3	71.8	87.0
Moderate	12.3	14.7	10.0	8.5	19.7	9.1
Severe	5.5	10.1	0.9	4.2	8.5	3.9

Table I: Sex and age distributions of children aged 6-23 months

Age category (months)	Boys		Girls		Total	Ratio	Overall mean age
	No (%)	$\bar{x} \pm SD$	No (%)	$\bar{x} \pm SD$	No (%)	Boy:girl	$\bar{x} \pm SD$
6-11	32 (44.4)	8.3 ± 1.9	40 (55.6)	8.3 ± 1.8	72 (32.9)	0.8	8.3 ± 1.8
12-17	38 (53.5)	14.6 ± 1.7	33 (46.5)	14.2 ± 2.2	71 (32.4)	1.2	14.3 ± 1.9
18-23	39 (51.3)	20.3 ± 2.0	37 (48.7)	20.3 ± 2.0	76 (34.7)	1.1	20.3 ± 5.2
Total	109 (49.8)	14.8 ± 5.2	110 (50.2)	14.2 ± 5.4	219 (100)	1.0	14.5 ± 5.3

SD: standard deviation

Water, hygiene and sanitation

The borehole (75.2%) was the main source of water that was used, followed by unprotected water sources (17.8%). Protected water source usage was 4.2% (Figure 2).

Table III: Complementary feeding practices in children aged 6-23 months

Complementary feeding practices	Age category (months)			Total
	6-11	12-17	18-23	
Current breastfeeding status				
Still breastfeeding	97.2	94.4	61.0	83.6
Stopped breastfeeding	2.8	5.6	39.0	16.4
Age of introduction of other foods (months)				
1-2	1.4	0	0	1.4
3-4	0	1.4	1.4	0.9
5-6	11.3	7.0	22.1	13.7
7-8	16.9	18.3	5.5	16.9
9-10	14.1	12.7	4.6	13.2
Foods consumed during past 24 hours				
Cereals	40.8	32.4	32.5	35.2
Legumes	19.7	21.1	26.0	22.4
Meat	1.4	0	3.9	1.8
Tubers and stems	0	1.4	1.4	0.9
Milk and milk products	0.5	0	0	0.5
Fats and oils	0	4.2	0	1.4
Fruit and vegetables	28.2	11.0	31.2	31.1
Sugars	0.5	0.5	2.6	1.8
Other	2.8	4.2	0.5	2.7
Dry tea	0	0	1.4	1.4
Liquid and foods given before six months				
Traditional medicine	4.2	0	0	1.4
Water	33.8	33.8	44.2	37.4
Juice	0.5	0	0	0.5
Cereal	4.2	5.6	6.5	5.5
Dry tea	1.4	0	1.4	0.9
Other	54.9	60.6	48.1	54.3
Number of times eaten during past 24 hours				
0	8.5	2.8	1.4	4.1
1	28.2	14.1	22.1	21.5
2	31.0	46.5	39.0	38.8
3	22.5	25.4	9.1	24.7
4	7.0	9.9	11.7	9.6
5	1.4	1.4	0	0.9
How the food is consumed by the child				
Own food	35.2	64.8	66.2	23.3
Plate shared with other children	5.6	12.7	26.0	15.1
Plate shared with an adult	5.6	8.5	3.9	5.9
Own plate, assisted by an adult	46.5	12.7	3.9	20.5
Other	7.0	1.4	0	2.7

The majority of the households did not have their own pit latrines (57.5%) and disposed of faeces in the bush (87%). Others defecated in the neighbour's latrine (8.1%), community latrine (4.1%) or buried the faeces in the backyard (0.8%). The water usage rate was 13.3 litres/person/day. A significant negative association (p -value = 0.05) existed between the amount of water used in the household and underweight in the children.

Findings from qualitative data analysis

Perceived understanding of undernutrition, its causes and its presentation in children

The participants used different local terms to describe undernutrition in children. The terms are associated with the clinical presentation of undernourished children. The predominantly used terms were *Bel* (a thin-bodied, reserved child who eats a lot and cries all the time), *Neto* (a thin-legged and big-bellied child), *Ajing* (a child who is thin-legged, does not grow and takes longer to walk compared to children of the same age) and *Cong Cam* (a child who eats any food that comes his or her way).

One participant in Kalongo described a malnourished child as follows:

"A malnourished child is always weak, irritable, cries a lot, is not interested in their environment, with a protruding belly, changed hair and skin colour, and sometimes has less hair".

Other participants described undernourished children as having big heads, wrinkled buttocks and skin, thin legs, and swelling of either the entire body, or just the cheeks, feet or hands.

Perceived causes of undernutrition in children

The participants reported that undernutrition was mainly caused by eating only one type of food that did not provide the child with sufficient nutrients and energy, or by consuming little or no food at all because of food insecurity. The female participants felt that mothers did not eat enough food to give them energy to produce milk to feed the children sufficiently because of food shortages. Gender-based violence was also reported to interfere with child feeding. It was seen as contributing to undernutrition.

One mother in Omiya Pachwa said:

"We, the mothers, often lack peace of mind due to gender-related violence which makes us fail to eat and hence the baby suffers and ultimately gets undernourished".

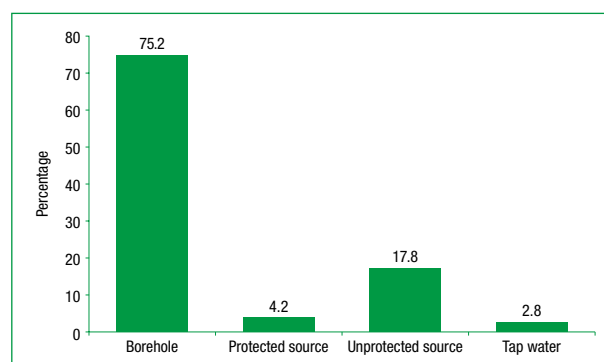


Figure 2: Main source of household water

Early pregnancy was cited as contributing greatly to childhood undernutrition, as mothers tended to wean the older child once they fell pregnant with another. Such children received limited motherly care and were often left in the care of elderly grandmothers who did not provide the children with adequate food and health care. Multiparity, which interferes with the ability of the mother to adequately take care of all the children, was associated with early pregnancy. Other diseases, such as malaria and diarrhoea, which are rampant in these communities, were said to cause undernutrition. The failure of caretakers to seek timely care from health facilities for sick children was also associated with disease.

Perceived consequences of undernutrition

Childhood undernutrition was perceived to kill children if it was not addressed timeously. It was also reported to cause brain retardation and failure of the child to grow and develop, with weight loss, swelling of the body and increased frequency of disease episodes.

A mother in Pader Town Council stated:

“Socially, malnourished children are hated and are stigmatised by in the community. No one is interested in carrying or playing with a malnourished child. The family is not visited by friends and relatives who despise them for letting malnutrition into the household”.

Undernutrition was also said to cause poverty because of the continuous expenditure that was needed to treat the child. It was a source of unhappiness and domestic violence in the family too, as the parents blamed each other for the child's undernutrition. Participants indicated that it also created an unhygienic home, as the child would defecate all the time.

Influencers of child feeding in the community

Health workers were reported to positively influence exclusive breastfeeding and the timing of complementary feeding. The mothers were the main decision-makers on child feeding and greatly influenced their dietary intake. Grandmothers also affected the child feeding practices and health care negatively and positively. They mainly filled the gap when the child's mother was absent or was sick.

One of the women in the focus group discussion in Kilak, Pader, explained:

“Grandmothers help prepare food, feed children and take children for treatment when they are sick. Being more knowledgeable of traditional practices, they provide undernourished children with specific nutritional remedies to treat them”.

However, grandmothers tended to offer cold, left-over food to the children. They also did not care if their own hands, or those of the child, were washed before and after eating food.

Expected roles of men in child feeding and nutrition

The community had many expectations of men regarding feeding the children. These included providing emotional support to the mothers so they were relaxed and able to provide adequate breast milk

and food for the children, supplying money to buy food so that the mother could eat enough to produce sufficient breast milk in order to exclusively breast feed, and teaching their wives about appropriate child feeding practices.

Barriers to child feeding and care

In the community, the main barriers to child feeding were frequent childhood illness, lack of “adequate breast milk”, insufficient food with which to feed the children, breast problems (such as cancer), and single parenthood. Lack of money to buy food, rampant alcoholism, lack of safe water and poor health care were additional barriers specific to these communities.

Discussion

This study has provided details of wasting and stunting prevalence, complementary feeding practices, water use and sanitation patterns, and a perceived understanding of undernutrition in returnee villages in the Agago and Pader districts in northern Uganda.

It is evident from the findings that the prevalence of wasting and underweight in children aged 6-23 months in these two districts is high. The global acute malnutrition prevalence of 11%, accounted for by 2.3% and 8.7% for severe wasting and moderate wasting, respectively, is above the 10% cut-off for the alert level. Wasting decreased significantly with the age of the children. Those aged 6-11 months were the most wasted. These findings on wasting are similar to those that were reported in the Uganda Demographic and Health Survey 2006.^{3,4} Wasting tends to intensify around the age of 9-11 months when children are introduced to complementary foods. This is because of an increased risk of diarrhoeal diseases that arise from unhygienic handling of the food and the use of inappropriate or inadequate feeding practices.³ The prevalence of underweight of 17.8% is similar to the national prevalence of 16% for underweight,³ but lower than that reported for northern Uganda where 28.6% of the children were underweight. Logistic analysis indicated that boys were twice as likely to be underweight than girls. This is consistent with other studies that have shown that more boys are underweight than girls.³ The reason for this is unclear. More targeted research is necessary to investigate this.

The qualitative findings confirmed that generally, communities understood the presentation and effect of undernutrition in children. The local descriptions of undernutrition are important in understanding the cultural perceptions that are associated with malnutrition in children. They are useful when designing appropriate interventions to prevent undernutrition.²¹ The descriptions relate to scientific features of protein energy and micronutrient deficiencies provided in the scientific literature²² and are thus reliable. The study has also confirmed that community members understood the causes and consequences of undernutrition in children. The causes of undernutrition that were described in these communities are no different from those that have been documented by the Food and Nutrition Technical Assistance II Project (FANTA-2) for Kitgum and Pader.²³ Through this study, community members demonstrated their

knowledge of the consequences of undernutrition and in particular, its associated economic, medical, socio-cultural and psychological effects on the children and households. Without sufficient understanding of the perceived consequences of undernutrition, it is difficult to plan targeted interventions to reduce its occurrence.

The child healthcare services of immunisation, vitamin A supplementation and deworming had wide coverage in the returnee villages. DPT3 immunisation coverage was similar to that reported for the Amuru, Gulu, Kitgum and Pader districts in 2008.²⁴ Measles vaccination coverage was similar to that of the Pader district (59.1%),²⁵ but was lower than the 79.2% reported for the northern region, and 85.6% for the Amuru, Gulu, Kitgum and Pader districts, in the Uganda Demographic and Health Survey (2006).²⁶ Vitamin A supplementation coverage (88.1%) was much higher than the previously reported values of 48–56% for the region.^{3,26} Unlike the situation in 2006, when it was more likely that children below 18 months would have received a recent vitamin A supplement than those aged 18–59 months,³ the current findings indicated no significant association between the age of the children and their receiving vitamin A supplements. It is important to note that there was no significant relationship between immunisation, deworming or vitamin A supplementation with regard to the nutritional status in the children who were studied.

Although the prevalences differed, the most common illnesses in children in northern Uganda have remained the same. In 2008, children in the IDP camps in northern Uganda mainly suffered from fever (84.8%), coughing (81.7%) and diarrhoea (62%).⁴ Another survey on the IDP camps also found fever to be the most common illness, followed by respiratory infections.²⁵

This study revealed that the reported percentage and mean length of exclusive breastfeeding for six months in Pader and Agago was higher than the reported national figure of 11% in 2006.³ More than half of the children in this study experienced a timely introduction of complementary foods. This is similar to the 49% reported in the IDP camps in 2008.⁴ However, this could relate to knowledge, rather than practice. In the camps, 39% complementary foods were introduced to the children before the age of six months. The introduction of solid foods was delayed in 13% of children.⁴ However, the dietary intake confirmed the poor quality of food that the children were fed. These findings are similar to those reported earlier (2008) on children in the northern region where animal-based foods were rarely given.⁴ The current findings also revealed that low feeding frequency and the dietary diversity of the children is still problematic, and may continue to be so, unless specific interventions that address the cause are implemented.

The findings on knowledge and attitudes on infant feeding call for extensive education and counselling of mothers on good breastfeeding practices, including initiation within the first hour of life, on-demand breastfeeding, proper positioning and attachment of the baby to the breast, confidence-building with regard to breastfeeding, breast care and consumption of a diversified, yet affordable diet. Education and counselling would help to eliminate

some of the misconceptions that relate to the failure to breastfeed, such as lack of adequate breast milk. It is also vital that grandmothers and fathers are educated on appropriate child feeding and health care. This includes the need for maintenance of good levels of food and personal hygiene. It is inadvisable to focus on the mothers of the children only. Consideration should be given to other household and community influencers in order to achieve a lasting impact regarding the improvement of the nutrition status of the children. Given that many mothers are young girls that need guidance and support from elderly mothers on appropriate child feeding practices, this is of great importance. It is also important that community dialogues are held with the men to assist them to understand that it is essential that they support appropriate infant and child care and health. It is necessary that the men in these areas are taught and encouraged to perform appropriate infant and child care and health practices so they can influence their wives positively. Providing groups of men with seeds might enable them to start a business and make more money to buy food for the family. It is strongly advised that men should form men's clubs through which they could be educated on child health and nutrition. These men should then disseminate their newfound knowledge to men in other households.

The study has provided an insight into the poor state of water and sanitation in the two districts. The findings are similar to those that have been reported elsewhere. In Uganda, 12% of households lack any kind of toilet facility. The majority of these are in rural areas (14%), compared to 3% in urban areas.³ The Pader district has a mean of 37 people per latrine. This is above the recommendation of not more than 20.²⁷ Lack of appropriate faecal disposal facilities increases the risk of diseases, e.g. diarrhoea and dysentery. These are immediate causes of wasting in children, especially in those aged 6–11 months. There is a need to support pit latrine construction and mobilisation for their utilisation through community-led initiatives, such as community-led total sanitation.

A survey in the Pader district has revealed that the majority of households collect water from protected sources, mainly from boreholes.²⁷ The water usage rate per person per day is below the minimum standard of 15 litres/person/day. Therefore, water provision is inadequate in this region. Given the role of unsafe water in contributing to undernutrition through increased infection in children,²⁸ it is critical that communities are supported to increase their access to clean and safe water.

Conclusion

This assessment has informed the need for holistic approaches in addressing the challenge of wasting and underweight in children aged 6–23 months in the returnee villages of the Pader and Agago districts in northern Uganda. Interventions that target improvement in complementary feeding practices, particularly in the 6- to 11-month age group, while also addressing pertinent issues of water and sanitation, hold potential. The interventions should address the entire household, including women and men, to ensure a lasting impact. This is because both genders have a profound direct or supportive role to

play in addressing the causes of undernutrition in children. Finally, it is important that potential programme funders and implementers realise that the returning communities are not ignorant of the required practices of complementary feeding. Therefore, nutrition education and counselling should not be designed as a stand-alone intervention. It should take into account community livelihoods and water and sanitation empowerment. Supplementary and therapeutic feeding programmes are necessary and should be planned and implemented well, while empowering community members with the tools needed to address the underlying and immediate causes of undernutrition that presents in the respective areas.

Conflict of interest

The authors declare that they have no conflict of interest. The research was funded by the UNICEF World Food Programme, Uganda, through its support of the Lutheran World Federation Pader Field Office for the community-based supplementary feeding programme.

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