ARTICLE

Breastfeeding, complementary feeding and nutritional status of 6 - 12-month-old infants in rural KwaZulu-Natal

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Objective. To determine breastfeeding, complementary feeding and nutritional status of 6 - 12-month-old rural infants.

Study design. A cross-sectional survey was done. Breastfeeding and complementary feeding practices were determined by questionnaire; an unquantified food frequency questionnaire was used to determine usual food intake. Biochemical assessment of nutritional status included determination of haemoglobin, serum retinol, ferritin and zinc concentrations. Body length and weight were measured.

Setting/subjects. Subjects included 505 infants aged 6 - 12 months living in the Valley of a Thousand Hills, a rural area in KwaZulu-Natal.

Results. Breastfeeding had been initiated in the case of 96% of the infants. Milk feeds at the time of the survey included breastmilk alone (58%), breastmilk plus bottle feeds (23%), and bottle feeds alone (18%). Formula feeds were either dilute (54%) or concentrated (14%). First solid foods given were maizemeal porridge (55%), infant cereals (32%), and ready-to-eat bottled baby foods (9%). Various energy-rich foods were added to the porridge for most of the infants. Biochemical data showed that 20% of infants had serum retinol levels < 20 µg/dl, 67% had serum ferritin levels < 12 µg/l, 49% had haemoglobin levels < 11 g/dl, and 32% had serum zinc levels < 60 µg/dl. Anthropometric data showed that 16% were stunted and 6% were underweight.

Conclusion. Inappropriate feeding practices and micronutrient deficiencies should be addressed. This can be done through the community health worker programme, provided that the community health workers have adequate knowledge of infant nutrition.

Appropriate breastfeeding and complementary feeding practices and access to adequate amounts of appropriate foods are essential for optimal infant nutrition. In South Africa, children aged 6 - 23 months and those living in rural areas are the most vulnerable in terms of childhood malnutrition.[1] The period from birth to 2 years is widely recognised as the critical period, during which growth faltering and micronutrient deficiencies can occur. Nutritional vulnerability during this period results from poor breastfeeding and complementary feeding practices, coupled with high rates of infectious diseases.[2] The nutritional quality of foods offered is often poor relative to nutritional requirements.[2] For example, maizemeal, a bulky food of low nutrient density, is widely used as a complementary food in South Africa.[3,4] Although fortification of maizemeal is mandatory in South Africa, it is unlikely that the fortification of staple foods such as maizemeal will impact on infant nutritional status because of the small amounts infants consume relative to their high nutritional requirements. Inadequate knowledge of appropriate foods and feeding practices is often a greater determinant of malnutrition than lack of foods.[5] Identification of inappropriate infant feeding practices can assist in the development of appropriate strategies to address childhood malnutrition in this country.

The Nutritional Intervention Research Unit of the Medical Research Council of South Africa evaluated the effect of a fortified maizemeal porridge on the nutritional status of infants in the Valley of a Thousand Hills, a rural area in KwaZulu-Natal. The Valley Trust, a non-governmental organisation, facilitates a community-based health programme in the area that operates through health posts and involves more than

100 community health workers. The baseline survey of the randomised controlled trial provided an opportunity to determine feeding practices and micronutrient and anthropometric status of infants in an area where promotion of breastfeeding and nutritional education is part of a community health worker programme.

Subjects and methods

Study population

Subjects lived in the Valley of a Thousand Hills, a rural area of low socio-economic status in KwaZulu-Natal. The population density is low as families are scattered over an extensive hilly area. The community is predominantly Zulu-speaking. This cross-sectional study formed part of the baseline survey of a randomised controlled trial that was approved by the Ethics Committee of the South African Medical Research Council. Approval for the study was obtained from The Valley Trust and health councils and community leaders in the area. Mothers of participating infants signed a consent form after the purpose and nature of the study had been explained to them.

Data collection

Infants aged 6 - 12 months in the catchment area of 8 community health centres were recruited through the community health worker programme. The mother or caregiver, viz. a member of the family, usually the grandmother of the child, who cared for the child during the day (hereafter collectively referred to as caregivers), was interviewed by experienced fieldworkers in the local language (Zulu). Information on socio-demographics, household food security, maternal knowledge of vitamin A nutrition and the growth curve, breastfeeding practices, use of complementary foods and attitude towards infant cereals, was collected using a questionnaire developed from the guidelines of Gross *et al.*[6] Information on infectious morbidity was collected for the preceding 2 weeks. The questionnaire was piloted and revised before being finalised.

An unquantified food frequency questionnaire was used for qualitative assessment of dietary intake. Food items usually consumed by children in this age category have been identified previously (M Faber, 2000 – unpublished data). These data were used to compile a list of food items, and the frequency of consumption for the past month was recorded. Respondents had a choice of 5 options, namely: (*i*) every day; (*ii*) most days (not every day but at least 4 days per week); (*iii*) approximately once a week (less than 4 days per week but at least once per week); (*iv*) seldom (less often than once a week); and (*v*) never. Macro- and micronutrient intakes were quantified using a single 24-hour dietary recall, and have been described elsewhere.[7]

Anthropometric measurements were all taken by the same fieldworker, with the infant in light clothing. Weight was measured on a calibrated load cell-operated digital scale (UC-300 Precision Health Scale, A &D Co. Ltd, Tokyo, Japan) accurate to 50 g. Recumbent length was measured to the nearest 0.1 cm using a length measuring board with an upright wooden headboard and a sliding footboard. Date of birth and birth weight were obtained from the child's Road-to-Health card. The anthropometric data and age of the child were used to yield 3 measures of nutritional status, namely length-for-age, weight-for-age, and weight-for-length, which were expressed as *z*-scores using the EpiInfo 2000 software package. Children with length-for-age *z*-score, weight-for-age *z*-score and weight-for-length *z*-score below 2 standard deviations (SD) of the median of the reference population were classified as stunted, underweight, and wasted, respectively. Children with weight-for-length *z*-score above 2 SD of the median of the reference population were classified as overweight.

A non-fasting blood sample (5 ml) was collected via antecubital venepuncture, with the child in a supine position. One millilitre was transferred to an EDTA tube for determining haemoglobin concentration, and the remainder was transferred to a gel and clot activator tube (SST II Plus, Becton Dickinson and Co Vacutainer Systems, Plymouth, UK). The latter was centrifuged (750 x *g* for 10 minutes at room temperature), and aliquots of serum were transferred to a series of Eppendorf tubes that were put in a coolbox containing ice packs. The serum was frozen later the same day at -20ºC. All tubes were trace element-free to avoid contamination with zinc. After completion of the survey the serum samples were transported to the Nutritional Intervention Research Unit in Cape Town and stored at -80ºC until assayed.

Haemoglobin concentrations were determined on the day of blood collection using the cyanomethaemoglobin method (Drabkin reagent) using a portable photometer (Ames Minilab, Product No. 7316, Miles Inc., Ind., USA). Blood samples of known haemoglobin concentration were used as the reference. Serum ferritin concentrations were determined by immunoradiometric assay (Ferritin Mab Solid Phase Component System, ICN Pharmaceuticals, NY, USA) using an Auto Gamma 500C counting system of United Technologies Packard, USA and an external control sample (Ligand 1,2,3, Chiron Diagnostics Ltd., Halstead, Essex, UK). Serum retinol concentrations were determined using a slightly modified version of the reversed-phased HPLC method described by Catignani and Bieri.[8] Serum zinc concentrations were determined using flame atomic absorption spectrophotometry (Philips Pye Unicam SP9, Cambridge, UK) with a commercial control serum (Seronorm Trace Elements Serum, SERO AS, Billingstad, Norway) as a quality control. The coefficient of variation for haemoglobin, ferritin (at high concentrations) and retinol assays was < 5%, and for ferritin (at low concentrations) and zinc assays 5 - 6%.

Because ferritin, retinol and zinc are acute-phase reactants, C-reactive protein (CRP) was measured as a marker for infection. CRP was determined using an immunoturbidimetric method (Technicon method No. SM4-0183G89, Technicon RA-1000 auto-analyser, Technicon Instruments, NY) with the use of Bayer TESTpoint Serum Protein Controls (Bayer Diagnostics, Fernwald, Germany).

Data analysis

SPSS software (version 10.0; SPSS, Inc., Chicago) was used for data analysis. Categorical variables are presented as frequency distributions. Continuous variables are presented as either the mean and SD or the median and 95% confidence interval (for skewed data). In cases where the infants were categorised into subgroups, group differences were analysed using either analysis of variance or chi-square analysis.

Results

A total of 505 infants aged 6 - 12 months were included in the study. Four hundred and forty-one mothers and 64 caregivers were interviewed. The average age of the infants (52% boys and 48% girls) was 9.0 (significant deviation (SD) 2.1) months. Eight per cent of the infants were born at home. Of the 464 infants born in a health facility, the birth weight was available for 432. The prevalence of low birth weight (< 2 500 g) was 13%. Morbidity reported for the 2 weeks preceding the survey included skin rash/sores (46%), fever (35%), diarrhoea (29%), coughing (29%), and runny nose (28%).

Socio-demographic information and maternal characteristics are given in Table I. Ninety-four per cent of the households had access to tap water, and 90% had access to toilet facilities. Approximately one-third of the households had a home garden, which was mostly for daily food needs; only 4% of households had sold some of the produce in the previous month. A high percentage (84%) of the mothers of the infants were not married, and 24% of the mothers were 19 years or younger at the time of the survey.

Sources of nutritional information and nutritional knowledge among the caregivers are given in Table II. The community health workers were the main source of nutritional information. Knowledge with regard to vitamin A nutrition was poor. Only 19% of the caregivers knew that vitamin A is a nutrient in food, and only 4% could name 3 foods that are good sources of vitamin A. The caregivers were shown four growth curves, namely a growth curve that is (*i*) flattening; (*ii*) going down; (*iii*) following the reference curve; and (*iv*) going up too sharply. When asked to identify the growth curve of a well-growing child, 32% of the caregivers selected the most appropriate growth curve. Most of the caregivers (82%) said that solid foods should be introduced at 4 - 6 months. According to 35% of the caregivers, special baby foods are better for the infant than ordinary foods.

Breastfeeding and complementary feeding practices are given in Table III. Breastfeeding had been initiated

Table I. Socio-demographic information and maternal characteristics

Socio-demographic indicator	% households (*N* = 505)
Household size*	8 (8.6, 9.3)
Access to tap water†	94
Toilet facilities‡	90
Electricity in the house	77
Traditional housing§	57
Food security	
Always enough food to eat	32
Sometimes not enough food to eat	55
Often not enough food to eat	13
Locally produced vegetables	
From community garden¶	17
From home garden‖	37
Maternal characteristics	
Formal education ≤ 7 years	28
Marital status: single	84
Age (years)**	25 (7)

*Median (95% confidence interval).
†Tap outside the house (63%), tap inside the house (6%), public tap (6%), neighbour's tap (19%).
‡Pit latrine (88%), flush toilet (2%).
§Round huts made with either mud or clay.
¶Mostly cabbage (12%), carrots (12%), spinach (12%), onions (9%), tomatoes (6%), maize (5%).
‖Mostly maize (22%), spinach (15%), carrots (14%), cabbage (13%), imifino (12%), legumes (beans) (12%), pumpkin (11%), onions (11%), tomatoes (8%), potatoes (6%).
**Mean (SD).

for 96% of the infants. Exclusive breastfeeding up to the age of 6 months was non-existent. At the time of the survey, 206 infants (41%) received bottle milk feeds (either alone or in combination with breastfeeding); 91% of these bottle feeds were formula milk and 9% were full-cream milk powder. The method of preparation of the formula feeds was available for 145 of the 187 infants who received formula milk. These data showed that only one-third of the formula feeds were prepared correctly, while 14% were concentrated and 54% were dilute. Solid foods were introduced at an average age of 3.3 (SD 1.5) months. Solid foods were given before the age of 4 months to 61% of the infants. A soft porridge made with maizemeal (55%) was the most popular first solid food given, followed by infant cereals (32%). All but 2 infants ate a porridge made with maizemeal, either as a soft porridge or as a stiff porridge (*phutu*), at the time of the survey. Various energy-rich food items were added to the porridge for most (96%) of the infants. Twenty-nine per cent of the infants never ate infant cereals; in 18% of cases this was because it was too expensive, and in 7% of cases because the infant did not like it. In general, 58% of the caregivers were positive about the use of infant cereals. Only 13% of the caregivers were positive about the price of infant cereals; the remainder were either indifferent (35%) or negative (48%) because they considered these products too expensive.

Frequency of intake of certain food items is given in Table IV. A soft porridge made with maizemeal was consumed at least 4 days per week by 88% of the infants. Cooked porridge other than maizemeal porridge was consumed seldom or never by 92% of the infants. Pumpkin and butternut were the only two vitamin A-rich vegetables consumed at least once a week by more than half of the infants. Fruits consumed most often were bananas and oranges. More than 40% of the infants consumed savoury snacks at least 4 days per week.

Anthropometric indices are given in Table V. Few children were either underweight or wasted, while 16% were stunted and 23% were overweight. The anthropometric indices for infants from households with and without home gardens were compared, using

Table II. Sources of nutritional information and nutritional knowledge of the caregivers

	% caregivers (*N* = 505)
Source of nutrition information	
Community health worker	62
Clinic	33
Radio	26
Television	6
Newspapers/magazines	3
Family/friends	3
Did not get any information	22
Caregiver's nutritional knowledge	
Growth curve representing a well-growing child	
Flattening growth curve	16
Growth curve following the reference curve	32
Growth curve going down	12
Growth curve going up sharply	28
Not sure	11
Knew that vitamin A is a nutrient in food	19
Named	
Only 1 vitamin A-rich food	9
Only 2 vitamin A-rich foods	13
Three vitamin A-rich foods	4
Named one symptom related to vitamin A deficiency	13
Colour identifying vitamin A-rich vegetables	
Yellow/orange	16
Green	14
Dark-green	3
Appropriate age for introducing solid foods	
Before 3 months	13
4 - 6 months	82
After 6 months	5
Special baby foods are better for babies than ordinary foods	35

Table III. Breastfeeding practices and the use of complementary foods	% infants (N = 505)
Breastfeeding had been initiated	96
Current milk feeding practices	
Breastmilk and bottle feeds	23
Breastmilk alone	58
Bottle feeds alone	18
None	1
Infants for whom breastfeeding was stopped	
Before the age of 4 months	8
Before the age of 6 months	11
Exclusively breastfeeding	
Up to the age of 4 months	11
Up to the age of 6 months	< 1
Preparation of formula feeds (N = 145)	
< 25 ml water per scoop formula*	14
25 ml water per scoop formula	33
> 25 ml water per scoop formula†	54
Average age (months) for introducing solid foods‡	3.3 (1.5)
Introduction of solid foods	
Before 4 months	61
Before 6 months	87
First solid food given	
Porridge made with maizemeal	55
Infant cereal§	32
Ready-to-eat bottled baby food	9
Other¶	4
Food items usually added to the porridge	
Margarine	66
Peanut butter	42
Sugar	41
Formula milk	23
Fresh milk/milk powder	7
Eggs	5
Number of food items added to porridge	
None	4
One	36
Two	33
Three or more	27
Dietary supplement	12

*Concentrated.
†Dilute.
‡Mean (SD).
§Just-add-milk type (18%), just-add-water type (14%).
¶Includes potato, rice, yoghurt, cooked apple, biscuit, butternut squash.

analysis of variance. The mean z-score for length-for-age was higher for infants from households with home gardens (-0.8652 versus -1.1191, p = 0.021), while the z-scores for weight-for-age and weight-for-length did not differ. Compared with infants with CRP concentrations below 10 mg/l, infants with raised CRP levels had a higher prevalence of both stunting (13.6% versus 26.3%, p = 0.005) and underweight (5.5% versus 12.5%, p = 0.022).

The prevalence of anaemia and micronutrient deficiencies is given in Table VI. Twenty per cent of the children were vitamin A-deficient (serum retinol < 20 µg/dl), 67% had low iron stores (serum ferittin < 12 µg/l), 49% were anaemic (haemoglobin < 11 g/dl) and 32% were zinc deficient (serum zinc < 60 µg/dl). Iron deficiency anaemia (haemoglobin < 11 g/dl and serum ferittin < 12 µg/l) was present in 35% of the infants. The acute phase response was defined as serum CRP concentrations > 10 mg/l.[9] The prevalence of anaemia and micronutrient deficiencies for a subset of data that excluded infants with CRP > 10 mg/l are also given in Table VI. Raised CRP levels did not

Table IV.	Usual intake of food items by 6 - 12-month-old infants as determined by an unquantified food frequency questionnaire (%)			
Food	**Most days***	**Once a week**	**Seldom**	**Never**
Cereals/starches				
Bread	44	15	13	28
Maizemeal porridge – soft	88	3	2	7
Maizemeal porridge – stiff	23	20	14	43
Maizemeal porridge – fermented	2	10	10	78
Cooked porridge, other than maizemeal	4	4	5	87
Infant cereal	52	5	2	41
Rice	32	31	10	27
Potato	43	32	12	13
Dairy products				
Fresh milk	5	14	22	59
Milk powder	14	< 1	< 1	85
Yoghurt	22	39	24	15
Animal foods				
Meat	21	22	21	36
Chicken	12	40	13	35
Fish	1	15	13	71
Eggs	38	30	15	17
Legumes				
Beans	1	18	23	58
Soya protein	9	21	16	54
Peanut butter	27	31	14	28
Vegetables				
Pumpkin	32	30	22	26
Butternut	22	36	19	23
Carrots	3	21	20	56
Dark-green leafy vegetables	10	29	17	44
Cabbage	7	25	17	51
Tomato	4	18	26	52
Fruit				
Apple (mostly cooked)	9	25	19	47
Banana	29	36	16	19
Orange	36	36	17	11
Miscellaneous				
Sugar	50	2	5	43
Biscuits	27	29	15	29
Sweets	8	14	26	52
Savoury snacks	42	35	11	12
Carbonated drinks	12	26	19	43
Tea	23	4	8	65

*The categories 'every day' and 'most days' are grouped together.

affect the prevalence of anaemia or micronutrient deficiencies.

Discussion

Most of the households had access to basic services (water, sanitation, electricity), reflecting the involvement of The Valley Trust, whose activities in the area include water, sanitation and environmental issues.[10] The caring capacity of the mothers was compromised by the fact that 24% were 19 years or younger at the time of the survey and 84% were not married.

Although promotion of breastfeeding and nutrition education are part of the community health worker programme in the area, various inappropriate infant feeding practices were identified, namely lack of exclusive breastfeeding, early introduction of complementary foods, incorrect preparation of formula feeds, and frequent consumption of savoury snacks.

The use of carbonated drinks at this young age should be discouraged (12% of the infants consumed carbonated drinks at least 4 days per week, with an additional 26% at least once a week).

Most of the caregivers stated that the appropriate age for introducing solid foods is 4 - 6 months. Nonetheless, 61% of the infants were given solid foods before the age of 4 months. In the study population, maizemeal porridge was an integral part of the infants' diet,[7] as is generally the case for South African infants.[3,4] Not only is maizemeal a bulky food of low nutrient density, but it is also high in phytate, which is an inhibitor of iron[11] and zinc[12] absorption. Several food items, especially energy-rich foods such as margarine, were added to the porridge. The addition of micronutrient-rich foods to the porridge could have been more appropriate, as 23% of the infants were overweight for length (*z*-score > 2 SD) and the complementary diet was inadequate for most of the micronutrients.[7]

Table V. Anthropometric indices for 6 - 12-month-old infants (*N* = 505)

Length-for-age *z*-score	
Mean (SD)	-1.05 (1.15)
< -2 SD (%)	16
Weight-for-age *z*-score	
Mean (SD)	0.12 (1.34)
< -2 SD (%)	6
Weight-for-length *z*-score	
Mean (SD)	1.19 (1.17)
< -2 SD (%)	< 1
> 2 SD (%)	23

Forty-nine per cent of the 6 - 12-month-old infants were anaemic. A large proportion of the infants presented with micronutrient deficiencies; 32% were zinc deficient, 20% were vitamin A deficient and 35% presented with iron deficiency anaemia. Most of these values are in line with the baseline survey of the South African leg of a multicentre study done previously in the same area.[13] The median intake for iron and zinc for the participating infants has been reported to be below the estimated average requirement (EAR) of the Dietary Reference Intakes,[7] partly explaining the poor nutritional status of the infants. The prevalence of micronutrient deficiencies probably reflects the infrequent intake of foods of animal origin as well as of fruits and vegetables.

The high prevalence of anaemia, which is similar to the national figure for 6 - 11-month-old infants[1] is of concern, as children with low haemoglobin concentrations during infancy are at risk of being adversely affected in terms of developmental outcomes.[14] The prevalence of iron deficiency anaemia (35%) was significantly higher than the national figure of 9.3% for 6 - 11-month-old infants.[1] Infants have a high demand for iron because of rapid growth, and because of the low iron concentration in breastmilk, complementary foods must supply nearly all of the infant's iron requirements after the age of 6 months.[15] Foods of animal sources, which have a high content of highly bioavailable haem iron, were not consumed frequently. Addition of 25 g meat to a home-prepared vegetable puree meal of 7 - 8-month-old infants was shown to increase the absorption of non-haem iron.[16] A small increase in meat intake at the age of 8 months prevented a decline in haemoglobin concentration in

Table VI. Prevalence of anaemia and micronutrient deficiencies for 6 - 12-month-old infants

	All infants		Excluding CRP > 10 mg/l	
	N	**%**	**N**	**%**
Serum retinol	475		389	
< 10 µg/dl		1		< 1
10 - < 20 µg/dl		19		14
20 - < 30 µg/dl		46		47
≥ 30 µg/dl		34		38
Serum ferritin < 12 µg/l	486	67	402	69
Haemoglobin < 11 g/dl	498	49	400	46
Serum ferritin < 12 µg/l and haemoglobin ≥ 11 g/dl*	484	32	400	34
Serum ferritin < 12 µg/l and haemoglobin < 11 g/dl†	484	35	400	35
Serum zinc < 60 µg/dl	479	32	393	28
CRP > 10 mg/l	486	17		

The amount of blood obtained was inadequate to allow for all biochemical analysis for some of the infants.
*Iron depleted.
†Iron deficiency anaemia.

infants.[17] However the cost of foods of animal sources may prohibit daily consumption in areas of low socio-economic status.

In the developed world, commercially available baby products play an important role in meeting the nutritional requirements of infants[18] and iron-fortified formula is often the major source of dietary iron.[19] Although iron-fortified formula can prevent iron deficiency anaemia,[20] bacterial contamination of bottle feeds is of concern.[21] Furthermore, incorrect preparation of bottle feeds is often a problem,[21] as was the case in our study. Milk feeds that are too concentrated can cause hypernatraemic dehydration that can cause death or permanent brain damage.[22] Milk feeds that are too dilute deprive the infant of adequate energy and nutrient intake, thereby increasing the infant's vulnerability to undernutrition. Although bottle-feeding is not encouraged, it is important to ensure that mothers who do use formula feeds use the correct preparation method.

Micronutrient deficiencies, such as zinc, iron and possibly vitamin A, as observed in the present study, can contribute to poor growth.[23] Stunting was observed in the case of 16% of the infants. Both stunting and underweight were associated with raised CRP levels, suggesting that malnourished children were more prone to infections. The possibility that the raised CRP levels were indicative of HIV infection cannot be excluded, considering the high HIV prevalence rate in KwaZulu-Natal.[24]

Although the prevalence of stunting did not differ between infants from households with or without home gardens (data not shown), the higher mean *z*-score for length-for-age for infants from households with home gardens suggests a positive effect of home gardens on nutritional status. Gardens that focus specifically on yellow/orange-fleshed and dark-green leafy vegetables have been shown to improve the vitamin A status of 2 - 5-year-old children in rural KwaZulu-Natal.[25] 'Grow and eat your own vegetables and fruit for better nutrition, health and food security' was the key message of the Food Security, Nutrition and Health Campaign that was launched in South Africa on 2 April 2002.[26]

One of the aims of the Integrated Nutrition Programme initiated by the Department of Health in 1995 is to contribute to optimal growth of infants and young children through growth monitoring and promotion. The aim is to establish and strengthen sustainable growth-monitoring practices, firstly at health facilities, and secondly in communities.[26] Growth monitoring in the Valley of a Thousand Hills is done at the clinics. It is well recognised that successful growth monitoring is largely dependent on the caregiver's understanding of the growth curve.[27] The Department of Health's guidelines for growth monitoring and promotion[28] clearly state that the growth curve must be understood by both the health personnel and the caregivers. It is therefore important that the poor interpretation of the growth curve by caregivers in the study area be addressed. Caregivers' poor understanding of the growth curve is probably because of lack of good communication between health personnel and caregivers.[28] According to Ruel *et al.*,[29] growth monitoring can be made understandable to even those caregivers with low educational levels. In South Africa, the growth curve was well understood by caregivers participating in a community-based growth project in a village bordering the Valley of a Thousand Hills.[30]

Caregivers listed community health workers as their main source of nutritional information. It is therefore important that the latter have adequate knowledge of infant nutrition. Studies in rural areas in South Africa have shown that nutrition education programmes undertaken by trained local women improved infant feeding practices[31] and maternal knowledge of vitamin A nutrition.[32] A study should be undertaken to determine the nutritional knowledge of the community health workers, as this information may help to identify gaps that can be addressed during the training of community health workers. However, it is suggested that studies determining nutritional knowledge focus on food-related questions, rather than nutrient-related questions.

In conclusion, the lack of exclusive breastfeeding, early introduction of complementary foods and incorrect preparation of formula milk should be addressed. Giving savoury snacks and carbonated drinks to infants should be discouraged. Strategies should be developed to address micronutrient deficiencies. This can be done through the community health worker programme, provided that the community health workers have adequate knowledge of infant nutrition.

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