Weaning foods in West Africa: Nutritional problems and possible solutions

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Abstract

Weaning practices and the problems of weaning foods in West Africa are reviewed. The low nutrient density and high bulk of the weaning foods, early introduction of solid foods, and unhygienic practices predispose infants to malnutrition, growth retardation, infection, and high mortality. Multi-approach strategies, involving the development of improved recipes and processing, nutrition education, access to safe water, good sanitation, economic empowerment of women, reduction in workload, and promotion of breastfeeding, are recommended solutions to the problems.

Introduction

In many West African countries, exclusive breastfeeding is usually adequate up to three to four months of age, but after this period it may become increasingly inadequate to support the nutritional demands of the growing infant. Thus, in a weaning process there is always the need to introduce soft, easily swallowed foods to supplement the infant's feeding early in life.

The weaning process may be gradual, lasting for months until the infant is finally introduced to the family diet. On the other hand, in abrupt weaning, the infant is introduced straight into the family menu. This latter option creates a problem, as the child may not be able to eat enough of the adult diet to meet his or her nutritional needs.

In West African countries, weaning can be a period of problems and vulnerability for the survival of a child. We looked at the conventional or traditional weaning foods and weaning practices in some West African nations. The nutritive values, nutritional problems, and possible solutions are presented.

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Weaning practices and weaning foods in West Africa

According to the available literature, West African mothers usually breastfeed for 12 months. Many urban poor and rural women breastfeed for up to 18 to 24 months [1, 2]. These reports indicate that there is early supplementation with solid foods or early weaning. Although the majority of women start weaning their infants at the age of three to four months, a few begin within the first two months of life. The first solid food and the most popular weaning food is a thin cereal gruel that is called by different names depending on the type of cereal or the West African country.

In Nigeria the usual first weaning food is called pap, *akamu*, *ogi*, or *koko* and is made from maize (*Zea mays*), millet (*Pennisetum americanum*), or guinea corn (*Sorghum* spp.) [3–6]. In Anambra State most mothers introduce the thin gruel at three to six months of age [3]. The baby is fed on demand with a spoon or a cup, although in certain parts of the country, a few mothers use the traditional forced hand-feeding method [6].

After the successful introduction of cereal gruel, other staple foods in the family menu are given to the child. These foods include yam (*Dioscorea* spp.), rice (*Oryza sativa*), *gari* (fermented cassava grits), and cocoyam (*Xanthosoma sagittifolium*), which may be eaten with sauce or soup [7, 8]. These foods are usually mashed, thinned, or pre-chewed. As soon as a child can chew, he or she is given pieces of food from the family pot. Some authors observed that in certain communities the low-income families do not make a special effort to prepare weaning foods for the infants, who are fed modified or unmodified food from the family pot [9, 10].

People from low-income groups seldom feed meat, eggs, or fish to their infants, because of socio-economic factors, taboos, and ignorance [11–13]. Cherian reported that people from high-income groups used these foods more often and tended to add variety to their weaning foods [5].

Legumes are rarely used for weaning and are introduced much later (after six months of age) because of

the problems of indigestibility, flatulence, and diarrhoea associated with their use [14, 15]. However, Uwaegbute and Nnanyelugo noted that 67% of their study population satisfactorily used cowpea products for weaning [15].

Most Ghanaian mothers start weaning by the third month of life [2]. A few mothers, however, start after one month. On the basis of interviews with breastfeeding Ghanaian mothers, Armar-Klemesu and Wheeler reported that the main weaning food for infants up to six months of age was a traditional fermented maize porridge (*koko*) [16]. From six months onwards, the infants were given the family diet with complementary breastfeeding. The family foods on which the infants were weaned included dishes made from cereal, starchy tubers, legumes, and vegetables.

Ogi, prepared from maize or sorghum (couscous *ogi*), is a popular weaning food in Sierra Leone [17]. Other staple foods include yam, *gari*, *foofoo*, and legumes.

The weaning foods and practices in other West African countries are similar to these. Table 1 shows the traditional weaning foods in some West African countries and the ages at which the foods are introduced.

Nutritive value and nutritional problems of weaning foods in West Africa

Traditional weaning foods in West Africa are known to be of low nutritive value [18, 19] and are characterized by low protein, low energy density, and high bulk. Maize pap or *koko* has been implicated in the aetiology of protein–energy malnutrition in children during the weaning period [8, 20] Cereal-based diets have lower nutritional value than animal-based ones. Cereals form the primary basis for most of the traditional weaning foods in West Africa. The protein content of maize and guinea corn is of poor quality (table 2), low in lysine and tryptophan. These two amino acids are indispensable to the growth of the young child [23].

In Anambra State, Nigeria, Agu observed that pap contained only 0.5% protein and less than 1% fat, as compared with 9% protein and 4% fat in the original corn [24]. Indeed, Akinrele and Edwards concluded that the protein content of *ogi* or pap (corn gruel) was too low even to support the growth of rats [25]. Another report noted that corn gruel can provide some energy, but not other nutrients needed for the growth of the baby [26].

Guiro et al. similarly noted that the traditional millet gruel used for weaning Senegalese children was not energy dense and was insufficient to cover all the nutrient needs of the infant [18].

Cereal gruel processing methods have resulted in the loss of nutrients other than protein. Makinde and Lachance reported a 98% loss of the original tryptophan in maize during the processing of *ogi* [27]. Large losses of niacin during the processing of *ogi* were reported earlier [28], which could account for the high incidence of pellagra in the area.

The family diets to which some infants are weaned

TABLE 1. Summary of traditional weaning foods fed by West African mothers

Country	Food[a]	Age of introduction (mo)	Description
Nigeria	*Ogi*, pap, *akamu*, *koko*	3–6	Fermented cereal from maize, sorghum, or guinea corn
Ghana	*Koko*, *kenkey*	3–6	Fermented corn porridge
Sierra Leone	*Ogi*, couscous *ogi*	4–6	Cereal gruel from fermented maize or sorghum
Benin	*Ogi*	3–6	Cereal gruel from fermented maize, sorghum, or millet

Source: ref. 2.

a. Starchy grains, roots, and tubers (yam, *gari*, rice, and cocoyam + sauce) are also given.

TABLE 2. Nutritive value of traditional weaning foods as compared with commercial weaning products

Food	Energy (kcal)	Ash (g/100 g dry weight)	Protein (g/100 g dry weight)	Carbohydrate (g/100 g dry weight)
Traditional weaning foods				
Guinea corn pap	415	0.5	4	92
Maize pap	417	0.2	6	91
Millet pap	419	0.5	7	88
Millet pap + soya bean milk	420	1.8	19	74
Guinea corn porridge	412	1.0	5	91
Millet porridge + soya bean milk	413	2.2	23	70
Commercial products				
Lactogen	463	4.8	22	52
Similac	517	3.0	11	56
Cerelac	412	3.3	16	67

Source: refs. 15, 21, 22.

are also low in nutritional value. Indeed, many investigators [23, 25, 29] have reported that these traditional foods are low in protein and that other nutrients are lost due to poor processing. Bulk is a major problem of the traditional West African weaning foods [8, 20, 30]. For adults and older children, it is usually possible to achieve an adequate protein–energy intake by increasing the daily intake of starchy foods of low nutrient density. For infants and small children, however, the volume of the traditional diets may be too large to allow the child to ingest all the food necessary to cover his or her energy needs. A baby aged four to six months would need 920 g of corn gruel to meet daily needs of energy (740 kcal) and protein (13 g) [31]. This is an impossible task, considering the size of an infant's stomach. However, the use of foods of high nutrient density and frequent feeding schedules can help provide adequate food for growth and activity.

The problems inherent in the traditional West African weaning foods and feeding practices predispose the infant to malnutrition, growth retardation, infection, and high mortality. Guiro et al. rightly observed that one major cause of weaning-age malnutrition is complementation of breastmilk with cereal gruels that are of low energy density [18]. Thus, protein–energy malnutrition is a common problem among infants and children in the poor socio-economic groups of developing countries [32].

Severe protein–energy malnutrition results in kwashiorkor and marasmus. The inadequate growth or stunting produced as a result of poor supplementation is best described as hidden malnutrition. This is because the child may appear healthy while being severely malnourished.

According to the 1987 Ghanaian National Survey, 58% of the children were below 80% of the National Center for Health Statistics (NCHS) weight-for-age, 8% suffered from severe malnutrition, 40% were wasted, and 52% were stunted [33]. Amar-Klemesu and Wheeler observed that 30% of the infants who were fed cereal porridge and adult foods as weaning foods were malnourished [16]. They attributed this to inadequate complementation with breastmilk. In Nigeria, Akinele and Omotola investigated the energy and protein intake of infants and children of the low-income group [34]. They reported that about one-third to one-half of the infants suffered varying degrees of malnutrition and 10% were wasted and stunted. A more recent Nigerian National Survey conducted by the Demographic and Health Survey (DHS) in 1990 placed the proportion of underweight children under five years of age (those below –2 SD weight-for-age) at 36%, including 12% severely underweight (below –3 SD). The prevalence of stunting (below –2 SD height-for-age) was 43%, including 22% severe stunting (below –3 SD), while the levels of wasting and severe wasting were 9% and 2%, respectively [35].

An earlier 1986 DHS survey of children aged 6 to 36 months in Ondo State, Nigeria, found a 28% prevalence for underweight, 32% for stunting, and 7% for wasting. It is therefore clear that during the period of weaning, children in West Africa are very vulnerable to malnutrition, and one of the major factors that causes stunting or what makes some children appear stunted can be traced to inadequate food intake.

Children in West Africa are at high risk of infection during weaning. Malnutrition increases susceptibility to infectious diseases and affects child mortality from diseases such as diarrhoea, whooping cough, and acute respiratory infection [36]. It reduces the capacity of the host to resist the consequences of such infection, making death inevitable for some. As solid foods are introduced, infection with germs that cause diarrhoea or other diseases is more likely to occur [37]. The food is often contaminated because of poor handling, use of dirty water and utensils, and poor storage by rural and poor urban mothers. The story is similar for working mothers, who leave infants in the care of maids who are usually ignorant and inexperienced, and sometimes very unhygienic. Because of its poor nutritional status, the infant can hardly resist these infections. The frequent occurrence of such infections leads to malnutrition because of increased energy and nutrient requirements coupled with poor absorptive capacity. This in turn affects the nutritional status of the child and further lowers resistance to infection.

According to the available statistics from Nigeria, infant mortality is responsible for almost 50% of all deaths in children up to 14 years of age, and under-five mortality accounts for 93% of these deaths, 70% of which are attributed to preventable diseases [35].

Strategies for solving weaning food problems in West Africa

Many issues need to be addressed to solve the problems of weaning foods in West Africa. These include improving the quality of traditional weaning foods, ensuring household food security, providing nutrition education, and improving the income-generating activities of women.

Formulation and development of weaning foods of high nutritive value

Several strategies may be used to improve the nutritive value of weaning foods. The traditional West African weaning foods could be improved by combining locally available foods that complement each other in such a way that the new pattern of amino acids created by this combination is similar to that recommended for infants [21]. Cereals are deficient in lysine but have sufficient sulphur-containing amino acids that are lim-

iting in legumes. Therefore, the combination of cereals and legumes has been found to produce amino acid patterns that adequately promote growth.

Nigerian experience

Many researchers have worked extensively on cereal–legume combinations in Nigeria. For example, Fashakin and Ogunsoola [20] formulated nut–*ogi* (a mixture of corn gruel and peanut), Akinrele and Edwards [25] formulated soya–*ogi* (corn gruel plus soya bean), and the Collaborative Research Support Programme (CRSP) Cowpea Linkage Project at the University of Nigeria, Nsukka, formulated *cerebabe* (corn plus cowpea). Other useful combinations include *ogi* and melon protein (corn gruel plus melon seed) and cowpea–*ogi* [38]. Some of these combinations have been adopted by the food-processing industries and are available in the Nigerian market. Table 3 shows some blends used in West Africa [39].

However, Fashakin et al. observed that no single protein from the above sources was adequate to promote growth or enhance nitrogen retention as well as a milk-based diet [38]. To this end, a mixture of cowpea, melon, soya bean, and *ogi* was found to be superior to any single protein source in protein efficiency ratio, net protein retention, biological value, and net protein utilization [38].

Ghanian experience

Low-cost, nutritious, well-balanced weaning foods rich in protein and energy have been developed from locally available foods in Ghana. One such food is *weanimix*, a blend of legume (groundnut and/or cowpea) and cereal (maize) in the ratio of 1:4 w/w. However, Takyi et al. suggested that alfalfa could be incorporated into the weaning diet of infants [40]. This legume was found to contain higher levels of protein, minerals, and β-carotene and could support child growth better than weanimix.

Fermentation and germination

Fermentation enhances the nutritive value of food by increasing thiamine, nicotinic acid, riboflavin, and perhaps protein content as a result of microbial activity [41, 42].

Fetuga et al. observed that the digestibility, protein efficiency ratio, net protein utilization, and biological value were much higher in fermented beans than in uncooked beans [43]. Lopez et al. also noted that minerals were made more available and phosphorus was released from phytate during fermentation of corn (*Zea mays*) [44].

Fermentation can also reduce the high bulk of the traditional West African weaning foods by reducing the viscosity of the cereal gruel. During cereal fermentation, microbial activity hydrolyses starch granules, resulting in reduced viscosity of the porridge [N. I. V. Mlingi, personal communication, 1985].

TABLE 3. Estimated protein quality of weaning blends containing groundnut, cereal, and legume

Blend	Protein content (%)	Protein score (%)	NPV[a] (%)
10% groundnut + 80% maize			
+ 10% cowpea	13	66	9
+ 10% pigeon pea	13	67	9
+ 10% soya bean	14	70	10
+ 10% winged bean	14	73	10
10% groundnut + 80% millet			
+ 10% cowpea	13	74	10
+ 10% pigeon pea	13	75	10
+ 10% soya bean	15	77	11
+ 10% winged bean	14	81	12
10% groundnut + 80% sorghum			
+ 10% cowpea	14	58	8
+ 10% pigeon pea	13	59	8
+ 10% soya bean	15	63	10
+ 10% winged bean	15	66	10

Source: adapted from ref. 39.

a. Net protein value (net protein utilization × crude protein content).

In addition to fermentation, germination can improve the nutritional value of weaning foods by reducing the water-binding capacity of cereal flour. This allows the porridge to have a free-flowing consistency even with a high proportion of flour [45, 46]. Germination also converts insoluble proteins to soluble components and increases the levels of lysine as well as of vitamins B and C [47].

Dry milling

Dry milling can improve the nutritional value of weaning foods by conservation. As stated earlier, wet milling of cereal results in nutrient loss and allows contamination from dirty water. It is advisable to use dry milling because it is more hygienic and retains the nutrients in cereals.

Addition of sugar and oil

The addition of sugar and oil increases the energy content of cereal gruel.

Nutrition education

Ignorance and food taboos in West Africa can result in weaning foods of poor nutritional quality. Improving the nutritional value of the weaning foods by itself will not eliminate the problems. Training and nutrition education of the mothers is necessary to change feeding practices and provide correct information.

Nutrition education can easily be incorporated into primary health care programmes. Health workers and nutritionists can educate rural mothers about the importance of adequate weaning foods and practices, infant health, host defense systems, home-scale drying, processing, and so on. The importance of varying the baby's diet and practising good hygiene when handling and storing the baby's food can be included as well.

The teaching and training of rural mothers can have a long-term impact on weaning practices and nutritional status of West African children. In the Philippines a weaning education programme led to a reduction in the prevalence of malnutrition from 64% to 42% [48]. In Nigeria the Africare Child Survival Programme yielded similar results. The governments of some West African nations have yet to realize the importance of training and education.

Access to safe water and sanitation

The provision of water is perceived as a government responsibility. The governments of all West African countries should intensify their efforts to provide safe, pipe-borne water and proper sewage disposal in rural communities. These measures would go a long way to reduce the incidence of food contamination and infectious diseases in West Africa.

In 1989 about 70% of urban Nigerian populations, 50% of semi-urban populations, and 22% of rural populations had access to safe water, according to the Federal Office of Statistics [35]. Forty-eight percent of rural populations and 11% of semi-urban and urban populations named the "bush" as their place for waste disposal. Sixty-five percent of urban populations, 84% of semi-urban populations, and 49% of rural populations used pit toilets. Only 18% of urban households, 3% of semi-urban households, and no rural households had water closets. There is a need for improvement in this area, and many West African governments have intensified their efforts, in some cases with external assistance.

Development of recipe books

The development of books of recipes for weaning foods of high nutrient density using locally available foods is useful. Where recipe books are available, they should be properly distributed to mothers. For the rural illiterate mother, nutrition counselling and demonstrations are appropriate. The Nigerian Ministry of Health produced a booklet called "Nigerian Weaning Diets" that contains more than 40 recipes for weaning foods. WHO/UNICEF have produced similar booklets for health and community workers. The University of Nigeria Cowpea Research Project has also developed a book containing recipes for weaning and adult foods.

Improvement of purchasing power of women

The socio-economic status of women should be improved by increasing their purchasing power, which will ensure household food security. This can be achieved by improving income-generating activities for women. When there is enough food at home, some mothers may be able to make blends or mixes that are more nutritious than the conventional weaning foods alone. Improvement can be brought about through skill acquisition. The availability of appropriate ready-to-use flour from a village mill process will increase the use of weaning foods and decrease costs [48].

Appropriate time allocation for women

Rural women spend about three hours a day in meal preparation, as against one hour for child care [49]. Reducing the workload of rural West African mothers would save time and energy for tending the children. A typical rural African woman spends 14 to 18 hours per day (an average of 17 hours) working. African women are the key to household food security and nutrition. They form 47% of the continent's agricultural labour force and account for two-thirds of food production [50]. With such time- and energy-consuming activities, these rural women are not able to prepare nutritious weaning foods. Time- and energy-saving processing methods and equipment are needed for both agricultural and domestic uses in the rural communities.

Breastfeeding promotion

Mothers should practise exclusive breastfeeding for the first four to six months, and complementary breastfeeding should continue into the second year.

Summary and conclusions

Many of the traditional weaning foods used in West African countries are of low nutrient density. Cereal gruels and starchy roots and tubers continue to form the bulk of the weaning foods. Some children, however, are weaned directly onto the family diet early in life. Infant-feeding practices are not fully developed. Infection and malnutrition are problems associated with poor weaning methods.

A number of convenient commercial weaning foods are now available, but they are very expensive and out of the reach of the target populations. A different approach may be developed to offer rural and poor urban women the opportunity to feed their infants properly, perhaps through appropriate household- or village-scale technology. The governments of the West African countries need to address these problems seriously.

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