428 Dietary Risk Associated with Complementary Feeding Practices

Definition/Cut-off Value

An infant or child who has begun to or is expected to begin to 1) consume complementary foods and beverages, 2) eat independently, 3) be weaned from breast milk or infant formula, or 4) transition from a diet based on infant/toddler foods to one based on the *Dietary Guidelines for Americans*, is at risk of inappropriate complementary feeding.

A complete nutrition assessment, including for risk #411, Inappropriate Nutrition Practices for Infants, or #425, Inappropriate Nutrition Practices for Children, must be completed prior to assigning this risk.

Participant Category and Priority Level

Category	Priority
Infants 4 to 12 months	4
Children 12 through 23 months	5

Justification

Overview

Complementary feeding is the gradual addition of foods and beverages to the diet of the infant and young child (1, 2). The process of adding complementary foods should reflect the physical, intellectual, and behavioral stages as well as the nutrient needs of the infant or child. Inappropriate complementary feeding practices are common and well documented in the literature. Caregivers often do not recognize signs of developmental readiness and, therefore, offer foods and beverages that may be inappropriate in type, amount, consistency, or texture. Furthermore, a lack of nationally accepted feeding guidelines for children under the age of two might lead caregivers to assume that all foods are suitable for this age range.

The 2000 WIC Participant and Program Characteristics study (PC 2000) shows greater percentages of anthropometric and biochemical risk factors in children ages 6 to 24 months than in children 24 to 60 months of age (3). These differences could reflect physical manifestations of inappropriate complementary feeding practices. Although PC 2000 shows a lower dietary risk in the 6 to 24 month age group, this risk is probably under-reported due to the high incidence of other higher priority nutrition risks.

Age	Anthropometric Risk (%)	Biochemical Risk (%)	Dietary Risk (%)
6-11 mos	40	16	55
1 yr	41	14	76
2 yrs	37	12	80
3 yrs	32	9	80
4 yrs	35	7	79

The Institute of Medicine (IOM), in their report, Summary of Proposed Criteria for Selecting the WIC Food Packages identified specific nutrients with potential for inadequacy or excess for WIC participants. For breast-fed infants 6 through 11 months, the nutrients of concern for potential inadequacy are iron and zinc while those for children 12 through 23 months are iron, vitamin E, fiber and potassium. The nutrients of concern for excessive intake in children 12 through 23 months are zinc, preformed vitamin A, sodium and energy (4).

To manage complementary feeding successfully, caregivers must make decisions about what, when, where, and how to offer foods according to the infant's or child's:

- Requirement for energy and nutrients;
- Fine, gross, and oral motor skills;
- Emerging independence and desire to learn to self-feed; and
- Need to learn healthy eating habits through exposure to a variety of nutritious foods (1, 2, 5, 6, 7).

How WIC Can Help

The WIC Program plays a key role not only in the prevention of nutrition-related health problems, but also in the promotion of lifelong healthy eating behaviors. The process of introducing complementary foods provides a unique opportunity for WIC staff to assist caregivers in making appropriate feeding decisions for young children that may have lifelong implications.

Prevention of Nutrition-Related Health Problems:

Zinc deficiency

Zinc is critical for growth and immunity, as well as brain development and function. The concentration of zinc in breast milk declines to a level considered inadequate to meet the needs of infants 7 to 12 months of age (8, 9). Complementary food sources of zinc, such as meats or zinc-fortified infant cereals, should be introduced to exclusively breastfed infants by 7 months.

Iron deficiency

Hallberg states, "The weaning period in infants is especially critical because of the especially high iron requirements and the importance of adequate iron nutrition during this crucial period of development" (10). According to the Centers for Disease Control and Prevention (CDC), children less than 24 months of age, especially those between 9 and 18 months, have the highest rate of iron deficiency of any age group (11). In the third National Health and Nutrition Examination Survey (NHANES III), children ages 1 to 2, along

with adolescent girls, had the highest rates of overt anemia, while 9 % were iron deficient (12). Meanwhile, the Pediatric Nutrition Surveillance 2003 Report noted anemia rates of 16.2 % in 6 to 11 months of age infants, 15.0 % in 12 to 17 months of age, and 13.5 % in 18-23 months of age children (13).

Picciano et al. reported that the intake of iron decreased from 98% of the recommended amount at 12 months to 76% at 18 months of age (14). In WIC clinics, Kahn et al. found that the incidence of anemia was significantly more common in 6 to 23 months of age children than in 23 to 59 months of age. The 6 to 23 months of age was also more likely than the older child to develop anemia despite a normal hemoglobin test at WIC certification (15).

Feeding practices that may prevent iron deficiency include:

- Breastfeeding infants exclusively until 4 to 6 months of age;
- Feeding only iron-fortified infant formula as a substitute for or supplement to breast milk until age 1;
- Offering a supplemental food source of iron to infants, between 4 to 6 months or when developmentally ready;
- Avoiding cow's milk until age 12 months; and
- Limiting milk consumption to no more than 24 ounces per day for children aged 1 to 5 years (11).

Obesity

Much of the literature on obesity indicates that learned behaviors and attitudes toward food consumption are major contributing factors. Proskitt states, "The main long term effect of weaning on nutritional status could be through attitudes toward food and meals learned by infants through the weaning process. This may be a truly critical area for the impact of feeding on later obesity" (16).

Birch and Fisher state, "An enormous amount of learning about food and eating occurs during the transition from the exclusive milk diet of infancy to the omnivore's diet consumed by early childhood." The authors believe that parents have the greatest influence on assuring eating behaviors that help to prevent future overweight and obesity (17).

The American Academy of Pediatrics (AAP) states, "…prevention of overweight is critical, because long-term outcome data for successful treatment approaches are limited…" and, "Families should be educated and empowered through anticipatory guidance to recognize the impact they have on their children's development through lifelong habits of physical activity and nutritious eating" (1). Parents can be reminded that they are role models and teachers who help their children adopt healthful eating and lifestyle practices.

Tooth decay

Children under the age of 2 are particularly susceptible to Early Childhood Caries (ECC), a serious public health problem (18). In some communities, the incidence of ECC can range from 20% to 50% (19). Children with ECC appear to be more susceptible to caries in permanent teeth at a later age (1, 20). Dental caries can be caused by many factors, including prolonged use of a bottle and extensive use of sweet and sticky foods (21).

The Avon Longitudinal Study of Pregnancy and Childhood examined 1,026 children aged 18 months and found that baby bottles were used exclusively for drinking by 10 % of the children and for at least one

feeding by 64% of the children. Lower income families were found to use the bottle more frequently for carbonated beverages than higher income families (22).

Complementary feeding practices that caregivers can use to prevent oral health problems include:

- Avoiding concentrated sweet foods like lollipops, candy and sweetened cereals.
- Avoiding sweetened beverages. Introducing fruit juice after 6 months of age (1) and only feeding it in a cup; and limiting fruit juice to 4-6 ounces/day.
- Weaning from a bottle to a cup by 12 to 14 months (23).

Promotion of Lifelong Healthy Eating Behaviors:

Timing of introduction of complementary foods

The AAP, Committee on Nutrition (CON) states that, "… complementary foods may be introduced between ages 4 and 6 months…" but cautions that actual timing of introduction of complementary foods for an individual infant may differ from this (population based) recommendation. Furthermore, the AAP-CON acknowledges a difference of opinion with the AAP, Section on Breastfeeding, which recommends exclusive breastfeeding for at least 6 months (1).

Early introduction of complementary foods before the infant is developmentally ready (i.e., before 4-6 months of age) is associated with increased respiratory illness, allergy in high-risk infants, and decreased breast milk production (7).

Infants with a strong family history of food allergy should be breastfed for as long as possible and should not receive complementary foods until 6 months of age. The introduction of the major food allergens such as eggs, milk, wheat, soy, peanuts, tree nuts, fish and shellfish should be delayed until well after the first year of life as guided by the health care provider (7, 24).

Delayed introduction of complementary foods, on the other hand, is also associated with feeding difficulties. Northstone et al found that introduction of textured foods after 10 months of age resulted in more feeding difficulties later on, such as picky eating and/or refusal of many foods. To avoid these and other developmental problems, solid foods should be introduced no later than 7 months, and finger foods between 7 and 9 months of age (25).

Choosing Appropriate Complementary Foods and Beverages

Complementary foods should supply essential nutrients and be developmentally appropriate (7). The WIC Infant Feeding Practices Study (WIC-IFPS) found that by 6 months of age, greater than 80% of mothers introduced inappropriate dairy foods (i.e., yogurt, cheese, ice cream and pudding), 60% introduced sweets/snack foods (defined as chips, pretzels, candy, cookies, jam and honey), and 90% introduced high protein foods (beans, eggs and peanut butter) to their infants. This study also found that, among the infants who received supplemental drinks by 5 months of age, three-quarters had never used a cup, concluding that most infants received supplemental drinks from the bottle. By one year of age, almost 90% of WIC infants received sweetened beverages and over 90% received sweet/snack foods (26).

The Feeding Infants and Toddlers Study (FITS) found that WIC infants and toddlers consumed excess energy but inadequate amounts of fruits and vegetables. In addition, WIC toddlers consumed more sweets, desserts and sweetened beverages than non-WIC toddlers (27).

Sixty-five percent of all food-related choking deaths occur in children under the age of 2. Children in this age group have not fully developed their oral-motor skills for chewing and swallowing. For this reason, they

should be fed foods of an appropriate consistency, size, and shape. Foods commonly implicated in choking include hot dogs, hard, gooey or sticky candy, nuts and seeds, chewing gum, grapes, raisins, popcorn, peanut butter and hard pieces of raw fruits and vegetables and chunks of meat or cheese (1, 28, 29).

Introducing a Cup

Teaching an infant to drink from a cup is part of the process of acquiring independent eating skills. A delay in the initiation of cup drinking prolongs the use of the nursing bottle that can lead to excess milk and juice intake and possible Early Childhood Caries (ECC). Weaning from a bottle to a cup should occur by 12 to14 months of age (23).

Helping The Child Establish Lifelong Healthy Eating Patterns

Lifelong eating practices may have their roots in the early years. Birch and Fisher state that food exposure and accessibility, the modeling behavior of parents and siblings, and the level of parental control over food consumption influence a child's food preferences. Inappropriate feeding practices may result in under- or over-feeding and may promote negative associations with eating that continue into later life.

Normal eating behaviors such as spitting out or gagging on unfamiliar food or food with texture are often misinterpreted as dislikes or intolerances leading to a diminished variety of foods offered. Infants have an innate preference for sweet and salty tastes. Without guidance, an infant may develop a lifelong preference for highly sweetened or salty foods rather than for a varied diet (17).

A young child gradually moves from the limited infant/toddler diet to daily multiple servings from each of the basic food groups as described in the Dietary Guidelines (30). The toddler stage (ages 1-2 years) may frustrate caregivers since many toddlers have constantly changing food preferences and erratic appetites. In addition, toddlers become skeptical about new foods and may need to experience a food 15-20 times before accepting it (31).

Caregivers can be guided and supported in managing common toddler feeding problems. Feeding practices that caregivers can use to facilitate a successful transition to a food group-based diet include:

- Offering a variety of developmentally appropriate nutritious foods;
- Reducing exposure to foods and beverages containing high levels of salt and sugar;
- Preparing meals that are pleasing to the eye and include a variety of colors and textures; setting a good example by eating a variety of foods;
- Offering only whole milk from age 1-2; (Lower fat milk can be introduced after that age.)
- Providing structure by scheduling regular meal and snack times;
- Allowing the child to decide how much or whether to eat;
- Allowing the child to develop eating/self-feeding skills; and
- Eating with the child in a pleasant mealtime environment without coercion.

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