



Revisión

Review of complementary feeding practices in Mexican children

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Abstract

Background: The early introduction of food is consistent with a significant increase in the prevalence of overweight and obesity, particularly in children, partly because of the resulting changes in feeding patterns. The purpose of this study was to describe the complementary feeding practices of Mexican children younger than two years of age.

Methods: Medline, Lilacs and manual methods were used to search for studies that assessed feeding practices in children younger than two years of age in Mexico. The following terms were used: complementary feeding, supplementary feeding, Mexico and weaning. Data on complementary feeding practices, including the age of initiation, the type of foods eaten, the frequency of food intake and the reasons for starting complementary feeding, were collected. The information gathered was subjected to qualitative analysis, and the data are presented as proportions in the tables.

Results: The seven studies included in this evaluation revealed that children were introduced to complementary feeding before the age of 6 months. Although fruits were the foods most commonly provided when complementary feeding began, processed juices, soft drinks and fried snacks were also offered. The intake of these products increased as the children grew older and coincided with a low intake of foods containing high-biological value protein, particularly red meats.

Conclusions: The results of the included studies showed that during complementary feeding, infants receive high-energy density foods, whereas the intake of foods that provide animal protein and iron in particular is low. In addition, common conditions associated with complementary feeding include overweight, obesity, malnutrition, and anemia, which may contribute to health problems.

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Key words: *Complementary feeding. Weaning. Child obesity. Overweight. Malnutrition. Anemia.*

REVISIÓN DE LAS PRÁCTICAS DE ALIMENTACIÓN COMPLEMENTARIA EN NIÑOS MEXICANOS

Resumen

Antecedentes: El inicio de la alimentación complementaria temprana coincide con un aumento significativo en la prevalencia de sobrepeso y obesidad especialmente en los niños, lo cual se debe entre otras causas a los cambios en los patrones de alimentación que se han experimentado. El objetivo del estudio fue describir las prácticas de alimentación complementaria en niños mexicanos.

Métodos: Se realizó una búsqueda de los estudios que evaluaron las prácticas alimentarias en menores de 2 años en México en Medline, Lilacs y de forma manual con los siguientes términos: alimentación complementaria, alimentación suplementaria, México, ablactación y destete. Se recabó la edad de inicio de la alimentación complementaria, tipo de alimento consumido, frecuencia de consumo de los alimentos y motivo por el que iniciaban la alimentación complementaria. Se realizó un análisis cualitativo de la información recolectada y los datos en las gráficas son mostrados como proporciones.

Resultados: Se incluyeron 7 estudios que mostraron que los niños inician la alimentación complementaria antes de los 6 meses predominantemente con frutas, aunque también consumieron jugos industrializados, refrescos y frituras. El consumo de estos productos aumenta con el crecimiento de los niños, aunado a un bajo consumo de alimentos con proteína de alto valor biológico, especialmente las carnes rojas.

Conclusiones: Los resultados de los estudios incluidos mostraron que los menores reciben alimentos con alta densidad energética, mientras que es bajo el consumo de aquellos que aportan proteína animal y hierro en particular, lo que puede contribuir a problemas de salud como sobrepeso, obesidad, desnutrición y anemia.

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Palabras clave: *Alimentación complementaria. Destete. Obesidad infantil. Sobrepeso. Desnutrición. Anemia.*

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Introduction

The proper feeding of infants and small children is essential for their health, nutrition and survival during the first two years of life¹. Metabolic and endocrine exposure during gestation and early childhood can modulate the later risk of obesity and associated disorders², and the early introduction of complementary foods has been found to increase the risk of chronic disease in later life. In contrast, among the nutritional problems prevalent in Mexican children younger than 5 years old, we found malnutrition and deficiencies in vitamin A, vitamin C, zinc and iron³; these problems could be related to the late introduction of food or poor feeding practices when complementary feeding (CF) begins. These conditions can lead to growth failure², neurological and mental development impairments⁴, and functional isolation within the child's physical and social environment⁵.

Based on the above findings, early infancy has been identified as an important target period for prevention and health promotion; we need to understand early feeding habits to make appropriate recommendations that promote healthier lifestyles. During the first year of life, feeding consists of maternal milk or milk substitutes (when breastfeeding is not possible) and CF. The World Health Organization (WHO) and the United Nations Children's Fund have recommended that during the first six months of life, infants should be exclusively fed with maternal milk to achieve optimal growth, development and health⁶. In Mexico, the recommendations are the same⁷. From a nutritional perspective, after the first six months of life, infants must receive proper and beneficial complementary foods to meet their nutritional requirements, and natural breastfeeding should continue until the second year of life or even later⁶.

It is worth mentioning that CF is a process that begins when maternal milk no longer meets the infant's nutritional needs; thus, along with maternal milk, the infant requires other foods and beverages, which must be introduced gradually⁸. This process occurs from 6 to 24 month of age, until the child stops feeding from his/her mother and is capable of eating the same foods as the rest of the family¹. In addition to influencing the child's health status, CF constitutes a set of opportunities to shape the child's future eating habits⁹. Despite this knowledge, some authors have stated that CF receives less attention than breastfeeding does¹⁰, when in fact both are highly relevant to child health.

It has been documented that some influential forces, including friends, neighbors, relatives, and the food industry (through marketing), encourage mothers to introduce foods or liquids other than maternal milk earlier than health professionals recommend because those people and industries believe that maternal milk is insufficient to satisfy the child's energy and nutrition needs^{3,11}. Although infants reach gastrointestinal, renal and neurologic maturity by the age of 4 months old and can tolerate CF at that time, the recommendation is to wait until the 6th month¹². Evidence suggests

that infants who eat solid or liquid foods (other than maternal milk) before 6 months of age show a higher risk of infectious diseases and higher mortality rates compared with infants who continue exclusive breastfeeding¹³. Early CF has also been associated with the development of several pathologies, such as celiac disease¹⁴ and allergies¹⁵. In contrast, delays in introducing complementary foods can also be detrimental because they are critical to the development of motor skills during later infancy; in addition, maternal milk is incapable of fulfilling an infant's iron, zinc and vitamin A requirements after the 6th month of life¹⁶.

The risk of developing iron deficiency during the first 2 years of life is high because children may have inadequate body stores of iron at birth⁴. The rapid growth and development during infancy can result in inadequate iron stores because of the depletion of neonatal iron reserves by the 6th month of life coupled with low iron consumption as a result of bad feeding practices, such as the late introduction of animal foods⁹ or consuming foods with a high phytate content¹⁷. Forty-two percent of anemia cases are caused by iron deficiency⁴, and this condition is a public health problem in Mexico, with a prevalence of 24.4% in children younger than 5 years old¹⁷. Consequently, the potential health benefits of starting CF at the 6th month of life outweighs the potential risks; however, not all guidelines recommend starting CF at the sixth month, and some guidelines are based more on tradition or speculation than on scientific evidence⁸.

According to the data obtained through the National Nutrition Surveys conducted Mexico (Encuesta Nacional de Salud y Nutrición [ENSANUT]), exclusive breastfeeding from 0 to 5 months decreased from 22.3% in 2006 to 14.4% in 2012¹⁷. This decrease could be related to the introduction of beverages such as tea, water, and infant formulas¹⁸. This decrease in exclusive breastfeeding is correlated with a significant increase in the prevalence of overweight and obesity in the Mexican population, particularly in children (at present, 9.7% of children younger than 5 years old are overweight or obese)¹⁷; this increase in childhood overweight and obesity seems to be attributable to changes in feeding patterns, among other causes. There are insufficient data regarding when CF is initiated in Mexico. Although we know that 94.8% of infants older than 6 months old have already started eating solid or semisolid foods¹⁷, we do not know the percentage of infants that start eating before the 6th month of life or the types of foods they consume. Thus, the purpose of this study was to describe CF practices in Mexico among children younger than 2 years old.

Methods

We performed Medline, Lilacs and manual searches for studies in English and Spanish that assessed feeding practices among children younger than 2 years old in Mexico. We used the following MeSH and

DeCS terms: “complementary feeding, supplementary feeding, Mexico and weaning” and “alimentación complementaria, alimentación suplementaria, México, ablactación y destete”.

Articles published before 2001 were excluded because that was the year that the WHO updated its CF recommendations to propose that CF should begin between the 4th and 6th months of life. Duplicate articles and articles whose data were not clearly relevant data to our study were disregarded. The data collected included the child’s age at the onset of CF, the types of foods eaten, the frequency of food intake and the reasons for starting CF.

Informed consent was not required because this study was a review of descriptive studies and did not involve a clinical intervention; therefore, the study posed no risk to the participants. We performed a qualitative analysis of the study data, and the data are presented as proportions in the tables.

Results

Two hundred ninety-nine studies were found in the databases, and 5 were identified via manual search. We excluded 295 studies because they did not investigate

feeding practices in children younger than 2 years of age; additionally, one study was excluded because it evaluated practices in a country other than Mexico, and another study was excluded because it was conducted prior to 2001. Seven studies met the inclusion criteria (Table I), and the main findings are presented below.

The authors have implemented nationwide population surveys to learn about the feeding practices, nutritional status and health care of children 2 years old and younger. This survey was implemented in both the “Régimen obligatorio” (RO), a government health program that serves permanent or temporary employees, members of cooperative societies and people that the Federal Executive has identified through specific decrees¹⁹, and the “IMSS Solidaridad Program” (IS; currently known as IMSS Oportunidades), a government program that ensures the right to health care for Mexicans who lack social security and live in marginalized conditions in the states covered by this program exists^{20,21}. The nationwide survey “ENCOPREVE-NIMSS” (EI) and the “Seguro Médico para una Nueva Generación” (SMNG) survey revealed that CF started before the 6th month of life (at 4.3 months among RO patients and at 5 months in IS patients). Fruits, particularly apples, were the most commonly offered first

Table I
Characteristics of the included studies on complementary food practices among infants and toddlers 0 to 24 months of age in Mexico

<i>Author, year of publication n</i>	<i>Methodology</i>	<i>Age (months)</i>
Vásquez, 2007 ²⁵ 123	Two diet questionnaires (food frequency intake and 24 hr recall)	3-12
Flores, 2004 ²⁰ 22,727 (RO) 13,260 (IS)	A two-section questionnaire on the frequency of food intake (the regular intake in the sample and the frequency of intake one week prior to the interview)	0-23
Martínez, 2010 ²⁴ 40	A modified food frequency questionnaire (referred to in the study as “the questionnaire on the frequency of exposure”)	1) 1-5 2) 6-12 3) 13-24
Flores, 2012 ²³ 8,328	Questionnaires that evaluated a) the introduction of solid, semisolid and soft foods; b) diet diversity; and c) the intake of sweetened beverages and high energy density processed foods	Infants and toddlers younger than 23 months of age were divided into two groups: 1) 6-11 2) ≥12
Jiménez, 2010 ²⁷ 810	A food frequency questionnaire	Infants and toddlers between 5 and 24 months of age were divided into three groups: 1) <6 2) 6-12 3) 12-24
Monterrosa, 2012 ²⁶ 29	Interviews and home observations	Mothers with infants between 6 and 18 months
Flores, 2006 ¹¹ Not specified	Questionnaire regarding food and beverage frequency and intake. Frequency was established over one day, one week, two weeks and one month	Infants younger than 12 months of age were divided into two groups: 1) <6 2) >6

RO = “Régimen Obligatorio”
IS = “IMSS Solidaridad”

foods at the national level. The surveys also reported the feeding practices of infants <1 year old: 20.8% of infants younger than 6 months old ate fruit on a daily basis, while only 11.1% ate some vegetables. Some infants in the same age group consumed processed juices and soft drinks on a daily or weekly basis. Between 6 and 12 months of life, there was no increase in the number of infants who drank soft drinks, but there was a 300% increase in the daily or weekly intake of processed juices²². The SMNG also revealed that more than one-third of the infants in this age group ate fried snacks, cookies and candy, and the intake of these products increased during the second year of life. Additionally, approximately 22% of the infants in this age group drank soft drinks, and 38% of children older than one year consumed soft drinks regularly²³. Another study that aimed to identify the CF patterns and diversity as infants and preschoolers began to consume the family diet confirmed these results, reporting that of 26 infants younger than 5 months old, 8 (31%) started CF before the age of 4 months²⁴.

Other studies were conducted to determine the factors associated with the nutritional status of infants between 3 and 12 months old who stayed at day care centers. The data from these studies revealed that 25.6% of mothers started introducing solid foods to their infants before they were 4 months old, either based on their own decisions or because they were influenced by health professionals. The study by author Vazquez-Garibay, et al showed that the complementary foods eaten daily or almost daily included fruits (94.3%), vegetables (91.9%), dairy products (98.4%), juices (87.8%) and cereals (74.8%). Legumes were consumed in minimal amounts, and 36.6% of mothers reported that their infants ate meat almost every day, while 39.8% reported feeding their infants meat less than once a week²⁵. Similarly, Monterrosa et al conducted a series of in-

terviews to obtain information about mothers' beliefs about CF. The researchers concluded that mothers offer their infants little "tastes" of foods before they reach the 6th month of life, and they do so to encourage better acceptance of foods later in life. In general, mothers make decisions about initiating CF according to the following factors: first, health professionals' advice, and second, their perceptions of their infant's gestures and the presence of teeth. The most foods that infants most often ate between 6 and 8 months of age were broths, soups, fruits, vegetables, tortillas, chicken and petit Suisse cheese. As the infants grew, they consumed a greater variety of foods in these groups²⁶.

In contrast, Jimenez et al studied the risk factors for obesity in infants and small children from low-income families in three cities in Mexico. The study showed that 92% of mothers introduced solid foods into their infants' diet before 6 months of age, and the most frequently eaten foods included vegetables, fruits and juices; the consumption of sweetened beverages and high-fat foods was also observed. Infants between 6 and 12 months old showed a lower intake of vegetables and fruits, while the intake of sweetened beverages and high fat content foods increased. Twelve to twenty-four-month-old infants showed a high intake of sweetened beverages and high-fat foods²⁷.

In general, the studies showed that fruits were the foods that infants most often received when they started CF; however, the data also showed that infants younger than 6 months old consumed processed juices, soft drinks and fried snacks on a regular basis and that the intake of these products increased with age. Although exclusive breastfeeding is recommended until infants are 6 months old, the four studies that reported juice consumption among infants showed that this practice began when infants were younger than 6 months old (Fig. 1); moreover, 51% of these infants drank

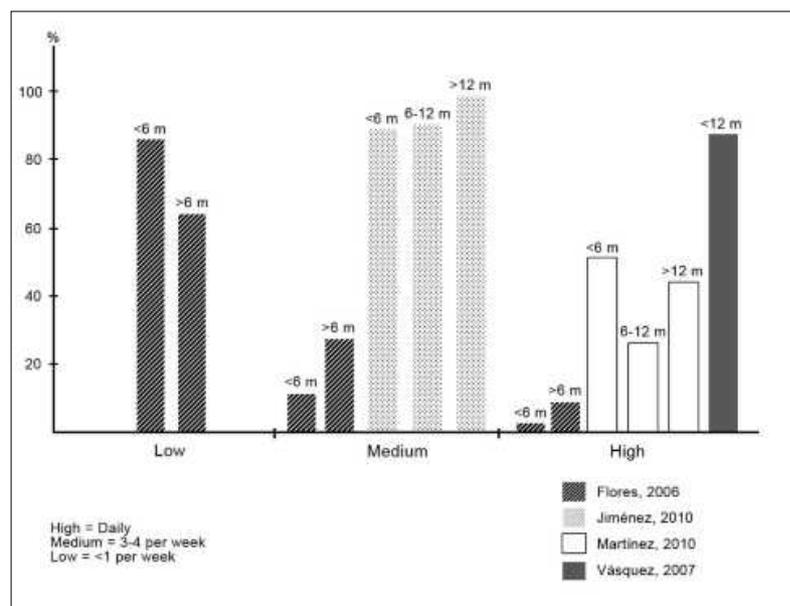


Fig. 1.—Frequency of fruit juice consumption among infants and toddlers 0-24 months of age in Mexico.

juice daily²⁴, and 99% of 12-month-old infants consumed juice 3 or 4 times a week. One study concluded that almost all 12-month-olds drank juice regularly²⁷.

Another aspect worth mentioning is the low intake of foods such as red meats, fish and eggs, which are sources of high-biologic value proteins and micronutrients, such as iron, in the case of red meat, and zinc and vitamin A, in the case of eggs²⁸. Among the studies that reported the intake of red meats, none identified a daily intake greater than 50% in any age group; the highest reported intake showed that 43% of children older than 12 months ate meat on a daily basis. In contrast, the most commonly reported frequency of meat consumption was less than once a week (Fig. 2).

Discussion

CF is commonly initiated before the timeframe recommended by international (WHO) and national organizations (the Ministry of Health). This finding might be a response to previous recommendations that CF begin between the 4th and 6th month of life^{29,30}. Another important reason for the early introduction of foods is the mother's interpreting her infant's movements as a desire to eat together with her belief that maternal milk is no longer sufficient. Mothers believe that a baby's cry is a signal that "he/she is still hungry"; hence, they resort to purees and juices to satisfy their babies' hunger³¹. Mothers base their decision to start CF on advice from health professionals; however, this advice is not always the most accurate. Some authors found that both physicians and nurses recommend beginning CF before the 4th month of life, and fruit juice is the most frequently recommended supplement during this period²⁶.

The consumption of juice and soft drinks can cause health problems in children (such as diarrhea, flatulence and colic) because these beverages have a high fructose and sorbitol content¹¹. A systematic review concluded that juices and soft drinks (particularly soft drinks) provide energy but only minimal amounts of nutrients, and they displace other food sources that can provide nutrition; these conditions have been associated with diseases such as diabetes³². Additionally, these beverages and other foods with a high energy content might contribute to overweight and obesity³³.

In Mexico, iron deficiency is the leading cause of anemia. The highest prevalence of anemia (38%) occurs among children between 12 and 23 months of age. This finding concurs with the documented low intake of animal-origin foods. Although data on the intake of cereals (which can provide iron if they are fortified) are available, we do not know whether these cereals are fortified or to what extent; hence, we were unable to identify whether cereals could be considered good sources of iron for this population. It is worth emphasizing that anemia can have negative consequences in children, including disturbances in social, cognitive and motor development; furthermore, children with iron deficiency are more susceptible to infections because anemia reduces cellular immunity³⁴. Although anemia can be corrected with supplements, its effects during the first years of life are often irreversible³⁵. Early CF does not improve a child's growth or nutritional status, even when the foods offered are considered "nutritious"; on the contrary, these foods displace maternal milk, which is the only food that infants younger than 6 months of age need, even if little "tastes" of complementary foods are offered.

During CF, children start developing their dietary habits, so proper feeding regimens should be encoura-

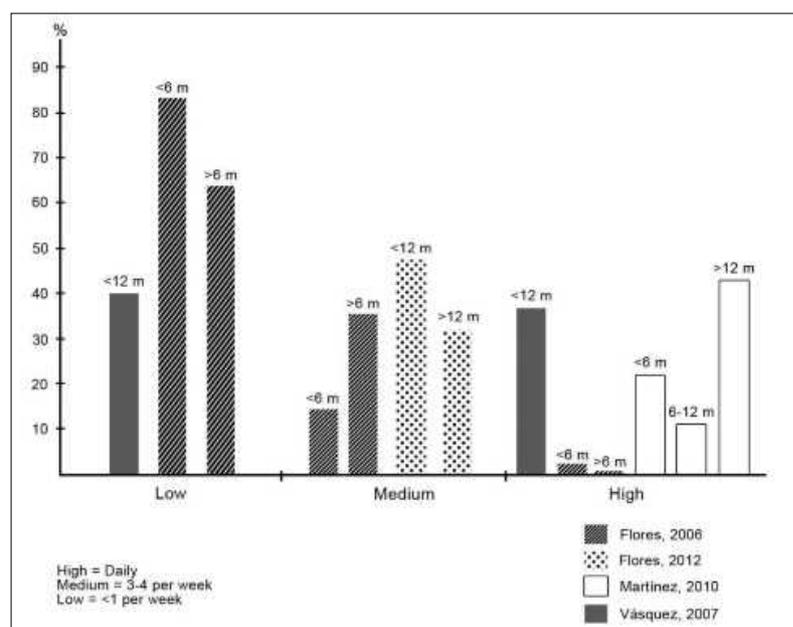


Fig. 2.—Frequency of red meat intake among infants and toddlers 0-24 months of age in Mexico.

Table II
Recommended ages for introducing foods and recommended complementary feeding regimens

Age (months)	Foods to be introduced	Frequency	Consistency	Recommendations
0-6	Exclusive maternal breastfeeding	<i>Ad libitum</i>	Liquid	Continue breastfeeding beyond 1 year of age.
6-7	Vegetables (zucchini, chayote, carrots, and chard)	2 to 3 times per day	Fruits and vegetables: purees and fruit scrapes offered directly to infants	Do not add salt or sugar.
	Fruits (apple, pear, apricot, banana, papaya, and mango)			
6-7	Cereals (rice, corn, wheat, oatmeal, amaranth, barley, precooked and supplementary infant cereal)	2 to 3 times per day	Cereals: mashed with maternal milk	Add one food at a time for two or three days to assess tolerance and exclude any allergies.
	Meats (beef, chicken, turkey, veal, pork, and liver)*			
7-8	Legumes (beans, fava beans, chickpeas, lentils, and kidney beans)	3 times per day	Pureed, finely chopped, mashed	Only offer the legumes, not the cooking liquid.
8-12	Dairy products (cheese, yogurt and others)	3-4 times per day	Finely chopped, small pieces	Eggs and fish should be introduced only if there is no family history of allergies to these foods. Otherwise, introduce them after the 12 th month.
	Eggs and fish			
>12	Citric fruits, cow's milk The child's feeding is integrated with the family's diet.	Family diet: 4-5 times per day	Small chunks	Avoid processed foods, such as soft drinks, juices, cakes and junk food. Cow's milk is not recommended before the 1 st year of age.

*Except sausages or cold cuts made with any of these meats

It is necessary to guarantee the iron and zinc supply via complementary feeding, so daily consumption of meat and other animal foods (1-2 ounces) is recommended starting at six months of age. Adapted from (7).

ged (Table II). We need more unified information and proper methodologies to facilitate the analysis of CF¹⁷. One of the limitations of this study was that the researchers used diverse methodologies, which hindered proper comparisons of their findings.

In conclusion, the studies included in this review showed that infants frequently consumed high-energy density foods and had a low intake of foods that provide animal protein and iron, which could contribute to health problems. Further information about CF practices is required for a deeper understanding of feeding patterns in children 2 years old and younger. We must strive toward disseminating information and encouraging proper CF, with the goal of improving children's health and their future eating habits.

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