College of Paediatrics and Child Health Singapore (CPCHS)

SINGAPORE GUIDELINES FOR FEEDING AND EATING IN INFANTS AND YOUNG CHILDREN

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INTRODUCTION

Nutrition plays an important role in the first 2 years of life, shaping not only a child's eating preferences but also long-term health and development (1). Provision of nutrition in childhood is complex, where multiple aspects of nutrient requirements, food variety, caregiver and child interaction, and environment must be considered.

In Singapore, gaps in infant and young child nutrition have been demonstrated by the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) longitudinal cohort study, including inappropriate food textures and intake of added sugars (2, 3). Suboptimal caregiver feeding practices can negatively impact the child's intake, suggesting the need for guidance and recommendations to improve nutrition provision and intake during this period (4, 5).

Infant and young child nutrition practices must be intentional and progressive to help children achieve the developmental and nutritional milestones needed for optimal health. However, there are currently no national guidelines focused solely on the transition from being fed at birth to independent eating at the end of the second year of life. This workgroup aimed to provide an in-depth review of the literature, while accounting for the needs and cultural context of our multi-ethnic population locally. As such, we have developed recommendations focusing on aspects of early nutrition which can be classified into 4 main domains: Variety, Autonomy, Setting, and Timing (VAST). These guidelines are meant to complement the Singapore Integrated 24-hour Activity Guidelines published by the Academy of Medicine Singapore in 2021, elaborating and adding on to some of the guidelines on nutrition provision in children 0 to 6 years (6).

TARGET AUDIENCE

Healthcare professionals, parents and caregivers of children aged 0 to 2 years. We aim for these guidelines to be readable by the lay person, and to enable all those involved in the care of children aged 0 to 2 years to play a role in healthy eating behaviour formation. These guidelines provide goals and milestones in the transition from infant feeding to eating in a young child. These guidelines are applicable to term, healthy infants without medical conditions and feeding disorders. Preterm infants or those with medical conditions should

seek advice from healthcare professionals. The workgroup utilized the GRADE Evidence to Decision frameworks for adoption, adaptation, and de novo development of trustworthy recommendations (GRADE-ADOLOPMENT) approach to developing guidelines (7).

GUIDELINES

Focus on early feeding practices for infants and young children to foster healthy eating behaviours and habits, supporting optimal growth and promoting long-term health.

Eating habits are formed in infancy and frequently carry over into childhood (8, 9), heightening the likelihood of rapid weight gain, childhood obesity, and metabolic disorders (10, 11). This predisposes individuals to the development of diabetes and cardiovascular diseases in later stages of life (12). Hence, it is imperative to cultivate healthy eating habits from an early age.

Feeding practices in infants and young children should prioritize the cultivation of healthy eating behaviours and habits while ensuring appropriate growth during this crucial developmental phase. This aligns with the recommendations of the Early Nutrition Project, which emphasizes that infant and young child feeding practices should be tailored to support appropriate weight gain (12). This is further substantiated by evidence demonstrating relationships between early feeding practices, eating habits, and weight gain velocity (11, 13).

Emphasize positive role-modelling in parents and caregivers to guide the development of healthy eating behaviours.

Parents and caregivers play a crucial role as role models in fostering healthy eating behaviours that endure from childhood through adolescence into adulthood. It is recognised that imitation forms a fundamental pillar of infant learning (14). These behaviours are influenced by a combination of maternal factors, socio-environmental elements, and informational factors, including knowledge, perceptions, attitudes, beliefs, and skills, all of which exhibit a positive correlation with the establishment of proper feeding habits (15). Additionally, studies indicate that frequency and variety of exposure, along with positive role modelling, contribute to increased vegetable consumption (16). Furthermore, evidence suggests that adequately preparing and providing healthy food positively affects a child's later diet, lipid profile, and micronutrient status, especially Vitamin D. This has also been shown through educational cooking interventions for parents during the introduction of solid foods to infants (17).

Attain eating habits that encompass children enjoying a variety of food at appropriate mealtimes while exercising autonomy in settings that are developmentally appropriate.

The workgroup has reached a consensus on four crucial domain areas, namely Variety, Autonomy, Setting, and Timing (VAST), which parents and caregivers should focus on to promote healthy eating behaviours and habits in infants and young children. These areas encompass encouraging food variety (V), establishing eating autonomy (A), cultivating distraction-free family mealtimes (S), and adapting to daytime eating schedules (T).

Ensure a diverse range of age-appropriate textures and flavours to provide an essential balance of nutrition, while emphasising the importance of healthy food preparation.

a. **Exclusively breastfeed infants for the first six months of life, and introduce complementary foods when developmentally appropriate, while continuing to breastfeed.**
b. **Between 6 and 12 months, introduce textures progressively into the infant's diet. Start with iron-rich food, preferably green vegetables. Provide early and repeated exposures to a wide variety of vegetables, fruit, carbohydrates, and proteins, without added sugar and salt.**
c. **From 12 months, provide foods that are similar to the rest of the family, focusing on nutrient-dense options.**
d. **In the first two years of life, avoid giving fruit juices and sugar sweetened beverages.**

Breastfeeding provides significant benefits for metabolic health of the child, particularly reducing risk of overweight and obesity of the child (18). The World Health Organization recommends that infants be exclusively breastfed for the first six months of life, and continued to be breastfed for up to two years or beyond (19). Breastfeeding is associated with a lower risk of rapid weight gain in infants in the first year of life compared to formula fed infants (20). Intake of fruit and vegetables have also been shown to be higher in infants breastfed for six months than those breastfed for less than six months (16, 21).

The introduction of complementary foods should occur around six months, but not earlier than four months, as earlier introduction may increase the risk of food allergies and excessive weight gain (22, 23). Between four to six months, complementary foods can be given when the infant demonstrates developmental readiness, e.g. the ability to hold their head up steadily, disappearance of tongue thrust reflex, showing interest in food and frequently putting things into their mouth (24).

The World Health Organization recommends to "gradually increase food consistency and variety as the infant gets older, adapting to the infant's requirements and abilities" (25). The introduction of lumpy solids after nine months of age has been associated with food refusal and picky eating reported later on in childhood (i.e. at 15 months, 38 months, 7 years) (26-28). As such, introduction of textures should occur gradually around 7-8 months, an important window for the development of oral skills and facial muscles, and no later than 10 months of age.

Iron is an important nutrient during the period of complementary feeding as iron stores in infants decrease around this period (22). There is strong evidence that iron-rich foods during complementary feeding, e.g. dark green vegetables, iron fortified infant cereals, meats and legumes, help maintain adequate iron status and prevent deficiency in the first year among infants at risk of insufficient iron stores or low intake (29).

Consensus reached by the British Nutrition Foundation proposes a “vegetable first approach”, considering the evidence sufficient to recommend vegetables as the initial complementary food. This approach increases vegetable acceptance early on, with potential benefits for later food preferences and intake (30). Considering a high prevalence of inadequate vegetable consumption reported in Singapore, we encourage caregivers to offer vegetables as the first food during complementary feeding, frequently and in a variety, according to accessibility and affordability (31). Early and repeated exposure to foods, including fruit and vegetables, have been shown as an effective strategy to increase acceptance of that particular food (16, 32). This can serve as a strategy to ensure adequate vegetable and fruit intake in infants and children.

Continued provision of a variety of foods during complementary feeding helps to ensure that a larger range of nutrients are consumed (26). Inclusion of foods from animal sources, such as meat, poultry, fish and eggs, during complementary feeding is associated with higher diet quality and improved physical growth in children in low- and middle-income countries (33). There is inadequate evidence to suggest that intake of meat during complementary feeding is associated with overweight and obesity (34).

Vegan and vegetarian weaning diets have been associated with a greater risk of inadequate growth and neurological deficits, with greater reported deficiencies in vitamin B12, vitamin D, calcium, iron and riboflavin (35). There is no evidence to delay the introduction of allergenic foods, even in children with family history of atopy or mild eczema (36). Please refer to the 2019 Academy of Medicine Singapore Consensus Statement for the Primary Prevention of Allergy in At-Risk Infants for more details.

A variety of flavours is also encouraged during complementary feeding. Consumption of home-made versus commercial/convenience complementary food was associated with higher diet diversity, better acceptance of new foods, higher HDL cholesterol levels and lower body fat within the first year of life (17, 37), suggesting that home-made foods with large variety may help broaden taste profiles compared to commercial foods. Most infants should be able to eat similar foods as the rest of the family by 12 months, and they require nutrient-dense foods such as meat, fish, eggs, fruit, vegetables and legumes (26).

Evidence suggests that sugar-sweetened beverage consumption during the first year of life is associated with increased obesity risk in childhood and poorer nutritional quality of diet (34). The intake of added sugars correlates with increased energy intake, development of non-communicable disease, including obesity and dental caries, and displaces intake of more nutrient dense foods. The WHO recommends to keep the intake of simple added sugars as low as possible at this age (38), while the United States Centre for Disease Control and Prevention (CDC) recommends avoiding all foods and beverages with added sugars before the age of two years (39). Although current evidence appears to have mixed outcomes, there seems to be a positive correlation between juice intake (including 100% fruit juice) in the first year of life and higher BMI z-scores (34). We thus additionally recommend the exclusion of all juices, including those without added sugar, before two years due to its high sugar content, potentially leading to a taste preference for sweet drinks and foods.

A preference for savoury tastes develops around four months of age, and early intake of foods containing sodium increases the preference for salty foods later in childhood (40). In view of the increased risk of hypertension with increased salt intake, various international organizations have recommended that no salt be added during the first year of life, as this may influence consumption of excessive salt later in life (22, 41). After the first year, salt may be used in moderation as part of adult foods and family meals.

Be attentive and responsive to hunger and satiety cues from birth. Encourage autonomy in feeding to nurture positive mealtime experience.

a. **From birth, respond to infant's hunger and fullness cues, allowing them to set the pace for feeding.**
b. **From six months, respond to infant's readiness to explore new textures and flavours. Encourage self-feeding and food play, allowing the infant to control the pace and determine the amount of food consumed.**
c. **By 12 to 18 months, involve the child in family mealtimes, using age-appropriate utensils. Encourage liquids from a cup instead of the milk bottle.**
d. **Between 18 and 24 months, build confidence for the child to eat and drink independently, using a fork, spoon, and cup.**

Allow infants to actively participate early in the weaning process, with introduction of finger foods and giving them autonomy in determining what, how much, and how fast to eat. The goal is to allow them to become more likely to consume the same food as their family and share the same mealtimes. They will be more be sensitive to feeling full, less demanding in relation to feeding, and less prone to being overweight subsequently (14, 42). Encourage the child to explore the food's textures, colours, tastes and shapes through food play so that they experience food in a fun way. Overall, they should also be perceived to enjoy feeding more (43, 44).

In addition to more ideal appetitive behaviours, autonomy in feeding also influences subsequent metabolic health, associated with higher intakes of "healthier" food such as vegetables and unprocessed foods, with appropriate energy self-regulation. This has implications on the child's physical growth and risk of developing obesity (43).

Traditional spoon feeding (TSF) should be integrated with responsive feeding practices to identify whether the child remains interested with hunger cues or is satiated. Responsive feeding helps infants to control caloric consumption (45). This promotes appropriate infant growth and reduces risk of developing obesity (46, 47).

In a systematic review and meta-analysis by Bergamini et al (48) and a randomized controlled trial comparing TSF and baby-led weaning (BLW) (49), the subsequent risk of developing overweight/obesity do not seem to significantly differ between the two groups. However, in a similar study by Taylor et al., BLW infants seem to show greater enjoyment of food and less food fussiness as compared to their TSF counterparts (49). A systematic review by D'Auria included 12 studies comparing TSF and BLW; and even though energy intake was similar

between the 2 groups with higher consumption of total and saturated fat by the BLW infants, those with BLW had lower mean body weight (50). It is important to note that the definition of and adherence to BLW may differ across studies; the key is to promote the child autonomy in self-feeding and observe responsive feeding practices, whichever the mode of feeding provided to the child.

Establish regular, family-centred mealtimes in a calm and distraction-free environment.

a. **From birth, provide a comfortable and soothing environment to promote a secure and nurturing feeding experience.**
b. **From six months, have baby safely seated at a designated dining area while providing solids.**
c. **From 12 months, make mealtimes family-centred to promote social interaction and eating enjoyment with the family.**
d. **Encourage parents and caregivers to interact with infant and child during feeding and eating while avoiding screens and toys.**

To cultivate a safe and positive mealtime experience for infants and young children, the CDC recommends seating them upright in a secure high chair or booster seat, facing the feeder or family members at the table (51). This approach supports the formation of a healthy environment with mindful eating, enabling the child to pay attention to foods and facilitating the beginning of shared meals at home.

The Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity underscores the value of family meals, emphasising parents and children dining together for targeted obesity prevention (52). The act of sitting down as a family for mealtime not only imparts crucial eating habits to the child but also contributes to the development of essential social skills (51). It allows the child to experience a diverse range of meal options mirroring those of the parents (6). Thus, eating healthy foods together with the child at each meal is important.

Allowing the child to have input into food choices and discussing healthy foods at mealtime conversations are strategies to be incorporated during family meals to enhance a child's positive eating behaviour (53, 54). These interactions can be further enriched by maintaining eye contact, offering smiles, and using positive facial expressions, creating a nurturing and engaging atmosphere. A supportive mealtime environment goes beyond these interactions to include the celebration of small milestones and achievements, such as trying new foods or engaging in self-feeding. Additionally, it involves ensuring that nutritious foods are easily accessible at home (54). Increasing the frequency of family meals has been associated with increased intake of nutrient-dense foods, particularly fruits and vegetables, resulting in a more balanced diet. Additionally, this practice fosters greater food enjoyment, reduces instances of picky or emotional eating, and enhances overall family dynamics, promoting increased interaction between parents and children (55, 56).

Moreover, maintaining a distraction-free environment during meals is vital for cultivating healthy eating habits (57). Children exposed to screens while eating tend to consume more unhealthy foods and display behavioural problems, including emotional reactivity and attention issues (58). To further support healthy habits, family members should set a positive

example by refraining from watching television or using electronic devices during meals, an important strategy to prevent overeating (59). Avoiding screen time not only contributes to the child's ability to self-regulate their eating behaviour but also enables the parent or caregiver to be attuned to the child's satiety and hunger cues, fostering a holistic approach to mealtime interactions.

Encourage a gradual transition from round-the-clock feeding towards eating in the day as the infant approaches their first year.

a. **In the first six months, observe and respond to the infant's evolving feeding pattern, recognising their natural shift towards longer intervals between feeds, especially at night.**
b. **From six months, promote the establishment of feeding during the day, recognizing that some infants may sleep 6 hours through the night, and do not need night feeding.**
c. **From 12 to 24 months, maintain a daily routine of 3 meals and 2 snacks, ensuring that meals and milk feeds are synchronised with their waking hours in the daytime.**
d. **Keep each meal duration to 30 minutes, and not longer.**

As infants grow, their circadian rhythm gradually matures, leading to more consolidated wake and sleep episodes by 3-4 months; typically, by 6-9 months, most infants can sleep through the night with at least 6 hours continuous sleep (60). To align with this circadian rhythm development, aim to provide daytime feeds, while gradually reducing night-time feeds. Around the age of 6 months (no later than 6 months and no earlier than 4 months), when the infant shows developmental readiness for complementary foods, gradually introduce solids from once a day to 2-3 times a day between 6-8 months. Increase this to 3-4 times daily between 9-11 months, and continue this pattern from 12-24 months (38). Additionally, offer additional nutritious snacks 1-2 times a day, with a maximum of three meals and two snacks, for children aged 12-24 months, as desired by the child (38).

Introduce these complementary foods at a regular schedule predominantly during the day (before night fall), with appropriate portions spaced every 2–3 hours to prevent overfeeding (59). Importantly, follow the infant/ young child's hunger cues and allow them to adapt to a daytime feeding schedule that includes milk feeds. Having a routine can help children know what to expect when it is time for meals or snacks (51). Avoid frequent snacks or grazing (i.e. repeatedly eating small portions within short intervals throughout the day), and using feeding to soothe or to get the infant/young child to sleep (61). It has been demonstrated that reducing night-time feeds for infants aged 6-12 months helps regulate calorie intake, contributing to optimal growth (62, 63). Local data indicates that infants consuming more calories at night (after 7 pm) than during the day at 12 months had higher body fat gain and an elevated risk of overweight and obesity by 24 months (64). Furthermore, it is advisable to wean infants off nocturnal feeds and bottle feeding to mitigate the risk of dental caries (6).

Lastly, caregivers are encouraged to establish a routine for infants and young children, ensuring they begin eating within 15 minutes after food is introduced, and to keep the total meal duration between 20-30 minutes (65). This approach has been shown to effectively minimize distractions and discourage disruptive behaviour during feeding (66). Maintaining a

structured routine for meal and snack times for young children is an important component of effective responsive feeding practices, enabling caregivers to recognize and respond to hunger and fullness cues in the child (67).

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This guideline summary, endorsed by College of Paediatrics and Child Health Singapore (CPCHS), Perinatal Society of Singapore, Health Promotion Board, Singapore Nutrition and Dietetics Association, Singapore Medical Association, and Singapore Paediatric Society, acts as an educational aid and reference for healthcare professionals practicing in Singapore.

The guideline summary does not define a standard of care, nor is it intended to dictate an exclusive course of management. It presents recognized clinical methods and techniques for consideration by practitioners for incorporation into their practice. It is acknowledged that management may vary and must always be responsive to the need of individual patients, availability of resources, and limitations unique to the institution or type of practice. Launched on 17 February 2023.

Summary Statements of College of Paediatrics and Child Health Singapore (CPCHS) Guidelines for Feeding and Eating in Infants and Young Children

*CPCHS-IPRAMHO Feeding and Eating in Infants and Young Children Study Group
23 February 2024

1. Focus on early feeding practices for infants and young children to foster healthy eating behaviours and habits, supporting optimal growth and promoting long-term health.

a. Prioritise the cultivation of healthy eating behaviours and habits.
b. Ensuring appropriate growth during this crucial developmental phase.
c. Tailored to support appropriate weight gain as early feeding practices and eating habits is directly related to weight gain velocity.

2. Emphasise positive role-modelling in parents and caregivers to guide the development of healthy eating behaviours.

a. Imitation forms a fundamental pillar of infant learning.
b. Frequency and variety of exposure will help in increasing vegetable consumption.
c. Adequately preparing and providing healthy food positively has a direct impact on a child's later diet, lipid profile and micronutrient status (especially Vitamin D)

3. Attain eating habits that encompass children enjoying a variety of food at appropriate mealtimes while exercising autonomy in settings that are developmentally appropriate.

4 crucial domain areas (VAST):

a. **V**ariety: Encouraging food variety
b. **A**utonomy: Establishing eating autonomy
c. **S**etting: Cultivating distraction-free family mealtimes
d. **T**iming: Adapting to daytime eating schedules

4. Ensure a diverse range of age-appropriate textures and flavours to provide an essential balance of nutrition, while emphasising the importance of healthy food preparation.

a. Exclusively breastfeed infants for the first six months of life, and introduce complementary foods when developmentally appropriate, while continuing to breastfeed.
b. Between 6 and 12 months, introduce textures progressively into the infant's diet. Start with iron-rich food, preferably green vegetables. Provide early and repeated exposures to a wide variety of vegetables, fruit, carbohydrates, and proteins, without added sugar and salt.
c. From 12 months, provide foods that are similar to the rest of the family, focusing on nutrient-dense options.
d. In the first two years of life, avoid giving fruit juices and sugar sweetened beverages.

5. Be attentive and responsive to hunger and satiety cues from birth. Encourage autonomy in feeding to nurture positive mealtime experience.

a. From birth, respond to infant's hunger and fullness cues, allowing them to set the pace for feeding.
b. From six months, respond to infant's readiness to explore new textures and flavours. Encourage self-feeding and food play, allowing the infant to control the pace and determine the amount of food consumed.
c. By 12 to 18 months, involve the child in family mealtimes, using age-appropriate utensils. Encourage liquids from a cup instead of the milk bottle.
d. Between 18 and 24 months, build confidence for the child to eat and drink independently, using a fork, spoon, and cup.

6. Establish regular, family-centred mealtimes in a calm and distraction-free environment.

a. From birth, provide a comfortable and soothing environment to promote a secure and nurturing feeding experience.
b. From six months, have baby safely seated at a designated dining area while providing solids.
c. From 12 months, make mealtimes family-centred to promote social interaction and eating enjoyment with the family.
d. Encourage parents and caregivers to interact with infant and child during feeding and eating while avoiding screens and toys.

7. Encourage a gradual transition from round-the-clock feeding towards eating in the day as the infant approaches their first year.

a. In the first six months, observe and respond to the infant's evolving feeding pattern, recognising their natural shift towards longer intervals between feeds, especially at night.
b. From six months, promote the establishment of feeding during the day, recognizing that some infants may sleep 6 hours through the night, and do not need night feeding.
c. From 12 to 24 months, maintain a daily routine of 3 meals and 2 snacks, ensuring that meals and milk feeds are synchronised with their waking hours in the daytime.
d. Keep each meal duration to 30 minutes, and not longer.

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