Infant and child nutrition

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Abstract

The quality and quantity of nutrition a child is given during infancy and childhood is vital to support optimal growth and development. Throughout childhood, there are periods of rapid growth and changing nutritional requirements. Children's diets change rapidly throughout childhood, progressing from a diet of milk alone to the commencement of complementary feeding, and ultimately to a diet consistent with the general dietary recommendations for adults. Measuring and weighing children, and recording key stages, is important to help identify nutritional difficulties.

Keywords Adolescents; breastfeeding; children; diet; infants; MRCP; nutrition

Key points

- The nutrition a child receives from birth and throughout childhood has a direct impact on their growth and development and their adult health. There are many standards and growth charts in place for monitoring the growth of infants and children
- Exclusive breast feeding is recommended for the first 6 months of live, however rates of breast feeding continue to be some of the lowest in Europe
- Nutritional risks vary at different ages whether this is due to faddy eating in younger children to increasing independence in adolescence, these can lead to common nutritional problems in childhood.

Introduction

A child's diet directly impacts on their growth and development, and also on their adult health. Achieving optimal intake reduces the risk of a number of common childhood conditions such as iron deficiency anaemia, vitamin D deficiency, obesity, dental caries and faltering growth.

There are, however, challenges in achieving optimal nutritional intakes throughout childhood. Infants, particularly preterm babies and those with rapid growth and development, are nutritionally vulnerable as a result of low nutrient stores. Preschool children can develop selective eating. With growing independence, school-age children and adolescents may start to experiment with restrictive diets, and are vulnerable to peer pressure and advertising when making their food choices. It is important that parents are given evidence-based, consistent and practical nutritional advice to support their child, and that children and adolescents themselves learn about managing their health and well-being, including the importance of making the right food choices.

Monitoring growth

UK growth charts have been derived from data from the World Health Organization (WHO), and are based on growth standards published in 2006 for children <5 years of age. The WHO growth standards, along with UK birth and preterm growth data, have been used to create the UK–WHO growth charts designed by the Royal College of Paediatrics and Child Health (RCPCH); these should be used to monitor the growth of children <4 years of age. UK growth charts 2–18, endorsed by the RCPCH, Department of Health (DH) and Healthier Scotland, should be used for plotting the growth of older children (see Further reading).

All infants should be weighed in their first week. If parents wish, or there is professional concern, babies can also be weighed at 6–8 weeks, 12–16 weeks and 12–13 months, or more frequently if there is clinical need. Supine length and head circumference should be measured in infants <2 years of age, and standing height in older children.

All children in Reception (age 4–5 years) and Year 6 (age 10–11) in UK first schools are measured as part of the National Child Measuring Programme (NCMP) (see Further reading). This aims to identify children who are falling outside the healthy weight range for their age, so that they can get support from National Health Service (NHS) services. Guidelines on weighing, measuring and plotting growth charts can be found on the RCPCH website.

Nutritional requirements

Nutritional requirements for adults and children were published by the Committee on Medical Aspects of Food and Nutrition Policy COMA in 1991, and revised by the Scientific Advisory Committee on Nutrition (SACN) in 2011. Energy requirements have been reduced for children <10 years of age and increased for older children. Full details of the nutritional requirements for infants, children and adults are available from www.nutrition.org.

Infants

The 2018 SACN report, *Feeding in the First Year of Life*,[1] gives information on feeding practice and evidence-based recommendations for feeding infants, including advice that all infants should be breastfed exclusively for the first 6 months of life (Table 1). Breast milk not only meets the nutritional needs of young infants, but also confers other benefits. These include improved sensory and cognitive development, fewer infections, slower, healthier weight gain, improved maternal health, including a lower risk of breast cancer and endometriosis, greater postpartum weight loss and a lower maternal body mass index.

The SACN report found that 75% of boys and 76% of girls exceeded the Estimated Average Requirement for energy. It was

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Summary of infant feeding guidelines[1]

Age range	Feed	Solids	Consistency	Feeding method
Birth to 6 months	Exclusive breastfeeding	• If started before 6 months, puréed fruit and vegetables. No added sugar or salt • Solids not to be introduced before 17 weeks	Smooth purée	Spoon feed
Around 6 months	Continue breastfeeding If formula feeding, use follow-on formula	• No added salt or sugar • No honey Include:	Thicker consistency with some lumps; soft finger foods	Encourage self-feeding Introduce a free-flow beaker for fluids
9–12 months	Continue breastfeeding If formula feeding, use follow-on formula	• Fruit, vegetables • Meat, fish, poultry, pulses, beans, eggs	Mashed, chopped or minced food; soft finger foods	Continue to develop self-feeding skills and use of free-flowing beaker
12 months and older	Continue breastfeeding If formula feeding, use follow-on formula Cow's milk may be introduced as a drink at 12 months	• Rice pasta, potatoes, bread, cereals • Cheese, yoghurt	Mashed, chopped or minced family foods; finger foods	Stop bottle feeding; use free-flow beaker for fluids

Table 1

found that infant formula was the greatest contributor to energy intake in infants <1 year of age.[1] Despite the proven benefits, the breastfeeding rate in England remains one of the lowest in Europe. The initial rate is around 80% at birth, dropping over the course of 6 weeks to 55%, and at 6 months to 34%.[2]

Complementary feeding (previously known as weaning) is defined by the WHO as the 'process starting when breast milk alone is no longer sufficient to the meet the nutritional requirements of infants so that other foods and liquids are needed, along with breast milk'.[3] Current SACN recommendations advise that complementary feeding should start at 6 months of age; however, it is recognized that some infants start solids earlier, and 17 weeks is the earliest age recommended for this.

Vitamin supplementation: current DH recommendations for children up to the age of 5 years are shown in Table 2. *Feeding in the First Year of Life* suggests that vitamin A supplementation is not required because of the low prevalence of vitamin A deficiency in the healthy infant population. Recommendations for vitamin D supplementation are unchanged.[1]

The Healthy Start scheme is a UK means-tested scheme aiming to improve the diet of and provide a nutritional safety net for low-income families. The following groups are eligible for Healthy Start vouchers and vitamins: all pregnant women <18 years of age and women who are >10 weeks pregnant or have a child <4 years of age and are on Income Support, income-based Jobseeker's Allowance or income-related Employment and Support Allowance, Child Tax Credit or Universal Credit.

The scheme allows families to exchange Healthy Start coupons for children's vitamin drops (containing vitamins A, C and D)[4] as well as foods such as cow's milk, fresh and frozen fruit and vegetables, and cow's milk-based infant formula. Some local NHS areas have chosen to provide Healthy Start vitamins to all children. In Birmingham, where there was a universal provision of Healthy Start vitamins, the uptake of these increased and there was a reduction in the incidence of symptomatic vitamin D deficiency.

Preschool children

Preschool children have high nutritional requirements relative to their size because of periods of rapid growth and development. In 2014, the National Diet and Nutrition survey (NDNS) identified that preschool children broadly meet nutritional recommendations for their age, apart from a slightly high intake of non-milk extrinsic sugars (all sugars that are not components of milk, including table sugar, sugars and syrups used in processing, honey, and sugars in fruit juices).[1]

DH recommendations for vitamin supplementation (up to 5 years of age)

Vitamin	Recommendation
A	All children to have a supplement unless drinking >500 ml of formula milk
C	All children to have a supplement unless drinking >500 ml of formula milk
D	All children to have a supplement unless drinking >500 ml of formula milk Breastfed infants to start supplements at 1 month of age if the mother did not take vitamin D supplements during pregnancy

Adapted from The British Dietetic Association — see Further reading.

Table 2

In 2016, Public Health England commissioned the Children's Food Trust to produce guidelines and menus for all early years providers, with the aim of ensuring that preschool children are given the right amount of energy and nutrients, and develop appropriate eating habits early in life. These guidelines are mandatory for all early years providers.

School-aged children

In 2013, the Department for Education introduced standards for school meals with the following aims: ensuring that food provided at school is nutritious and of a high quality; promotion of good nutritional health; protection of those who are nutritionally vulnerable; and promotion of good eating behaviours. The standards aim to reduce the amount of fat, increase the amount and variety of fruit and vegetables, and restrict the amount of sugar. From 2014, it was agreed that every child in Reception, Year 1 and Year 2 in state-funded schools would be entitled to free school lunches.

As part of their curriculum, primary school-aged children are all given education on the energy content of food and drinks, and on how a variety of foods is needed in the diet in line with current healthy eating advice.

Adolescence

Adolescence is a time of dramatic change, the uniform growth of childhood is taken over by a rapid growth spurt with a greater demand for nutrients. It is a time of hormonal, psychosocial and developmental change and, as a result, a nutritionally vulnerable period of time. Diets can change during this period because of issues with body image, and vulnerability to peer pressure, social media and advertising, leading adolescents to follow restrictive, unhealthy or fad diets.

The last NDNS in 2014 showed that adolescents are:

- not eating enough fibre – consuming only 50–60% of the recommended amount
- consuming insufficient fruit and vegetables
- consuming around a 20% higher salt intake than recommended
- if they are adolescent girls, consuming low intakes of vitamins and minerals, which can result in nutritional deficiencies, including iron deficiency anaemia, and affect bone health in later life.

As part of the curriculum in personal, social, health and economic education and design and technology, all young people are given education on healthy eating and the benefits of having a healthy diet and an active lifestyle.

Common nutritional problems in childhood

Iron deficiency anaemia

Iron deficiency anaemia is the most common micronutrient deficiency worldwide. Children are at risk because of their rapid growth and high iron requirements. Risk of iron deficiency anaemia increases in infants with a low birthweight, and in children with a high intake of cow's milk, a low intake of iron-rich complementary foods and low socioeconomic or immigrant status.[5] The European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) guidelines advise that routine iron supplementation is not required in healthy infants and toddlers who have a normal birth weight, but that low-birthweight infants should be given supplements of 1–2 mg/kg per day.

Infants should not be given cow's milk as their main drink until they are 12 months of age, and intake should not exceed 500 ml/day. Diets with a high volume of cow's milk are associated with an excessive intake of energy, protein and fat, and a low iron intake. Iron-rich foods, such as meat and pulses, should be introduced at 6 months of age. Children who are selective eaters are also at risk of iron deficiency anaemia.

Around 7.4% of adolescent girls have been shown to have a haemoglobin concentration below the WHO lower limit, because of a low intake of iron-rich foods and high requirements as a result of rapid growth as well as blood losses from menstruation.

Obesity

Rates of obesity in the UK are increasing; data from the NCMP have shown that >1 in 5 children are overweight or obese in Reception, increasing to almost 1 in 3 by Year 6.[4] Obese children are more likely to become obese adults and have an increased risk of morbidity, disability and premature mortality in adulthood.

National Institute for Health and Care Excellence (NICE) guidelines (see Further reading) recommend lifestyle weight-management programmes for the management of obesity in children and adolescents. These should involve the whole family regardless of their weight, and focus on diet, physical activity and behaviour change.

Tooth decay

Tooth decay is the most common oral disease affecting children and young people in England. Around 12% of 3-year-olds and 24.7% of 5-year-olds have tooth decay, with on average three or four teeth affected.

The risk of tooth decay is increased by a poor diet and a high intake of non-milk extrinsic sugars (NMES). There is a link between prolonged bottle-feeding and tooth decay, particularly when giving high sugar or acid drinks by bottle. When the child is 6 months of age, a non-valve, free-flow cup should be introduced to encourage children to sip rather than suck, and from 1 year of age a bottle should be discouraged.[1] Dental caries can be reduced by oral hygiene and a lowered consumption of sugary food and drinks, especially between meals and before bed.

Faltering growth

Faltering growth is defined as a slower rate of weight gain in childhood than expected for age and sex. In 2017, NICE released guidelines on recognition, assessment and monitoring of faltering growth in infants and children. It includes a definition of growth thresholds for concern, identifying the risk factors for, and possible causes of, faltering growth, the interventions and when to refer to other professionals (see Further reading).

Thresholds for considering faltering growth are:

- a fall across 1 or more weight centile spaces if birthweight was below the 9th centile
- a fall across 2 or more weight centile spaces if birthweight was between the 9th and 91st centiles
- a fall across 3 or more weight centile spaces if birthweight was above the 91st centile

- current weight below the 2nd centile for age, regardless of birthweight.

NICE guidelines recommend that infants or children with faltering growth should be discussed with or referred to a paediatric specialist care service if they have:

- symptoms or signs that might indicate an underlying disorder
- failure to respond to interventions delivered in the primary care setting
- rapid weight loss or severe undernutrition.

Selective eating

It is not uncommon for toddlers to go through phases of selective eating. Most children grow out of this, but it can be worrying for parents. As long as the child is active and gaining weight, they are getting enough to eat. Reassure parents to:

- give small portions and praise the child for eating, even if it is a small amount
- serve the same food to all the family and eat together
- stick to a routine – three meals a day plus snacks
- encourage the child to feed themselves
- make mealtimes enjoyable
- keep offering new foods. ◆

KEY REFERENCES

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5 Domellof M, Braeffer C, Campoy C, et al. ESPGHAN iron requirements of infants and toddlers. *J Pediatr Gastroenterol Nutr* 2014; **58:** 119–29.

FURTHER READING

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TEST YOURSELF

To test your knowledge based on the article you have just read, please complete the questions below. The answers can be found at the end of the issue or online here.

Question 1

A 2-year-old child was seen as part of a family case review. A diet history showed that the child was consuming mainly cereals, carbohydrate foods and cow's milk.

What is the main concern for this child's diet?

A. Iron deficiency anaemia
B. Obesity
C. Tooth decay
D. Protein deficiency
E. Nicotinamide deficiency

Question 2

A 12-month-old child was seen for review. Weight was on the 2nd centile, and length was on the 25th centile. Birthweight was on the 25th centile, having gradually crossed down the centiles over the previous 6 months. The child was well in all other respects.

What is the best action to take?

A. Continue to monitor the weight
B. Refer to a paediatrician
C. Advise increasing the calorie content of the food
D. Start nutritional supplements
E. Start tube feeding

Question 3

Which of the following would not be suitable for a 7-month-old baby when introducing solids?

A. Pasta
B. Sweet potato
C. Avocado
D. Honey
E. Cheese