Best practice in infancy: moving onto cups

Prolonged use of the bottle to feed infants is now known to contribute to health issues in children, which can extend into adult life. Dietitian **Elaine Gardner** reviews the evidence and presents the British Dietetic Association (BDA) policy statement on the best practice method of introducing a cup

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Learning Points

- Consistent and practical advice from professionals, following the BDA recommendations concerning the introduction of a cup, needs to be given to parents and carers
- Appropriate timing of advice at six months for all babies, and then at one year for bottle-fed babies, can support transferring fully to a cup
- Inappropriate introduction and use of a cup is linked with poor oral health, iron deficiency anaemia, delayed speech development and puts children at risk from obesity

As infants move onto eating solid foods, it is important to consider the introduction of a cup. The introduction should take place at around six months of age and should fully replace a bottle at one year. This is important as evidence shows the inappropriate or delayed introduction and/or prolonged use of a bottle alongside a cup, the incorrect style of cup and the provision of unsuitable contents (in terms of nutritional content and quantity) contribute to health issues in children and the subsequent risk of non-communicable diseases in adult life.

Public Health England* (PHE) (2014)
This guidance encourages parents and carers of young children to:
- Reduce both the amount and how often sugary foods and drinks are given to them
- Not add sugar to weaning foods or drinks
- Aim to introduce drinking from a free-flow cup from six months of age and stop feeding from a bottle from 12 months of age

Department of Health (DH) (2011)
'For optimum dental health, mothers should start to introduce infants to drinking from cups and beakers from about six months…..'

NICE Public Health Guidance 11 (NICE 2008)
'Encourage parents and carers to:
- Offer drinks in a non-valved, free-flowing cup from age six months to one year
- Discourage feeding from a bottle from one year onwards
- Provide milk and water to drink between meals (diluted fruit juice can be provided with meals - one part juice to 10 parts water)

Discourage parents and carers from:
offering baby juices or sugary drinks at bedtime.

Figure 1: Guidance concerning the introduction of a cup
*the other home countries of Scotland, Northern Ireland and Wales have similar guidance

Why an early introduction matters

Governmental guidance (see *Figure 1*) on introducing a cup to an infant is not being followed and bottles continue to be commonly used, either solely or in addition to a cup, beyond the appropriate age (Northstone *et al*, 2002; Avery & Baxter, 2001; DH, 2011). Additionally in breast-fed babies, there may also be a delay in the introduction of a cup.

Infants and children that continue with prolonged bottle use have:

- An increased risk of early childhood caries (ECC), especially if they sleep with a bottle at night (Hallett & O'Rourke, 2006; Azevedo *et al* 2005; Schroth *et al*, 2005; Tiberia *et al* 2007)
- A higher risk of severe early childhood caries (S-ECC) if bottles are used for liquids other than milk or water (Schroth *et al*, 2005; Feldens *et al*, 2010; Nishimura *et al*, 2008).

Prolonged use of lidded cups with bill-shaped extensions also show increased risk as they encourage sugary drinks to be in contact with teeth over long periods of the day (Behrendt *et al*, 2001). There is also consensus that prolonged bottle use and lidded cups delay speech development, with an open cup being the most appropriate choice to encourage skill development (ADA, 2014).

Observational studies support associations between prolonged bottle feeding, excessive milk intake and iron deficiency anaemia (Sutcliffe *et al* 2006; Bonuck *et al*, 2002; Brotanek *et al*, 2005).

Additionally, a prolonged use of bottles and excessive intake of liquids, including milk, is emerging as a risk factor for obesity in young children (Northstone *et al*, 2002; Bonuck *et al*, 2010; Gooze *et al*, 2011).

Oral health matters

ECC is an aggressive form of decay that is associated with long-term bottle use and with sugar-sweetened drinks, especially when these are given overnight or for long periods of the day. Examples of ECC are shown in *Figure 2*. If left untreated, ECC can lead to abscesses, pain and malocclusions with subsequent treatment commonly

including extractions under general anaesthetic. The prevalence of ECC in England varies between local authorities from <1% to 18%, but with an overall prevalence of 4% (PHE, 2014).

In a study of 771 children aged two, Menghini *et al* (2008) shows that the use of a night time bottle proved to be one of the strongest predictor variables for caries (alongside the presence of plaque due to poor toothbrushing). Other risk indicators include the frequent drinking of sugared non-milk drinks and sipping from a bottle during the day (Hallett & Rourke, 2006). These results echo previous studies from Shroth *et al* (2005) that identified behaviours typically associated with ECC and caries activity, such as poor oral hygiene and prolonged bottle feeding, with 88% of parents stating that they bottle-fed their child longer than the recommended time of one year. Additionally 86% put their child to bed with a bottle at night. The continuous use of a nursing bottle whilst falling asleep and during the night should be avoided.

Rates of decayed, extracted or filled teeth (deft) are significantly greater among children who have sugar added to the feeding bottle. Unfortunately using a bottle for other drinks apart from milk and water, including sugar-containing drinks, is common practice. Figures vary from 47% to 62% of parents (Avery & Baxter, 2001; Chan *et al*, 2002 respectively) offering other drinks such as fruit juice and squash (39%), tea (24%), Ribena (12%), herbal drinks (1%) and rusks (3%).

Babies don't need any type of juice or squash, including baby juice, either by bottle or cup. These are high in sugar and not required. To avoid additional 'sugar hits' on the teeth (if parents insist on giving juice or squash), advise the dilution of one part pure juice to at least 10 parts water (i.e. very well diluted) and to give only at mealtimes in an open cup, not at snack times.

Sealy *et al* (2011) found 81% of caregivers (n=207) reported that their children also used a baby bottle in combination with a cup, with only 12% solely using a cup. Professionals involved with parents and carers of young children need to ask about continued bottle use alongside the use of a cup and emphasise that a cup should fully replace a bottle at one year of age.

Cessation of bottle use at one year and use of non-sugar containing drinks (milk and water) reduces ECC (Davies *et al*, 2005).

The type of cup
The choice of cup is also important. Behrendt *et al* (2001) confirm the risk of tooth destruction, typical of nursing bottle syndrome, by prolonged and frequent consumption of cariogenic beverages from vessels with bill-shaped extensions, i.e. a lidded cup. Lidded cups encourage sugary drinks to be in contact with teeth over longer periods of time. Initially many parents unnecessarily prefer to use a lidded beaker to avoid mess, but encouragement should be provided to remove the lid to make an open cup as soon as possible and certainly when the infant has learnt how to drink.

Figure 2: Early childhood caries (ECC)

Figure 3: Suitable cups for use with infants. A free-flow lid is also shown (picture courtesy of V. Watson)
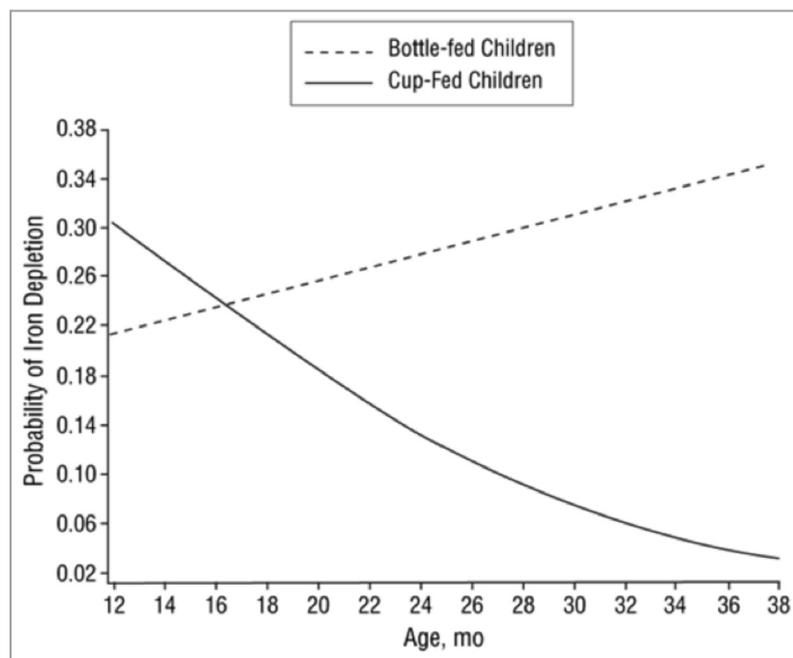

Figure 4: Probability of iron depletion in bottle versus cup-fed children, by age in months (Sutcliffe *et al*, 2006)

'Infants and children that continue with prolonged bottle use have an increased risk of early childhood caries. Observational studies also support associations between prolonged bottle feeding, excessive milk intake and iron deficiency anaemia'

Study	Age Group (number)	Results
Bonuck & Kahn (2002)	18-56 months (n= 95; preliminary study)	Bottle use significantly associated with obesity (>95th% BMI, p<0.0005); not significant with overweight (>85th% BMI, p<0.06)
Bonuck et al (2004)	3-5 years (n= 3027)	Bottle-feeding was significantly associated with obesity (>95th% BMI, p<.001)
Bonuck et al (2010)	12-60-months (n=150; pilot data	Among 12-36-month-olds, current [bottle] users were significantly more likely to be >95th% weight-for-height (19% vs. 0%, P < 0.02), and more were >85% weight-for-height (27% vs. 11%, P < 0.11), vs. non-users. In contrast, current bottle use was not associated with either overweight or obesity in 37-60-month-olds.
Gooze et al (2011)	5.5 years (n=6750)	Prolonged bottle use [at two years] was associated with an increased risk of obesity at 5.5 years (OR, 1.33; 95% CI, 1.05 to 1.68)

Figure 5: Studies looking at bottle use and overweight/obesity

Introducing a cup*

1. A cup can be introduced to an infant at around five to six months of age, once the infant is sitting up and able to hold their head steady.

2. An open cup should fully replace a bottle at around one year of age.

3. The cup should be made of appropriate food-safe material, have two handles and preferably no lid. A free-flow, lidded beaker (that lets the liquid run out when held upside down) is also suitable, but the lid should be removed to make an open cup as soon as the infant has learnt how to drink. Cups and beakers with non-drip valves are not suitable.

4. A small amount of water or milk (breast or formula) should be offered in a cup initially. From one year of age, full-fat cows' milk can be offered. For children over one year of age, water is the best drink to quench thirst and water or plain milk remain the best drinks.

5. Baby juice and fruit juice are not required by infants. Pure unsweetened juices contain free sugars and are acidic which can damage teeth. Parents who choose to give juice should be advised to dilute 1 part pure juice to at least 10 parts water, give only at mealtimes and in an open cup. Any other drinks (including squash, flavoured milks, smoothies, fizzy drinks) are not recommended for babies or toddlers. If parents choose to give these they should be restricted to mealtimes, given in an open cup and squash should be very well diluted with at least 10 parts water. The consumption of fizzy and/or sugary drinks should be minimised.

6. Tea, coffee and hot chocolate contain caffeine. Do not give to babies or young children.

7. A lidded cup or bottle should not be given to infants to help them get to sleep.

8. An infant should never be left alone when drinking and they should always be sitting upright. Avoid placing solid food (e.g. rusk or baby rice) into a cup or bottle.

* *Figure 6*: Recommendations on Introducing a Cup (BDA Policy Statement (2015)

'Over the last decade there have been a number of studies showing that a prolonged use of bottles and excessive intake of liquids, including milk is emerging as a risk factor for overweight and obesity'

Cups and beakers that can be turned upside down and do not allow liquid to flow out freely contain non-drip (spill) valves. These encourage a baby to suck and don't teach them how to develop the skill of sipping, which is important in the development of the muscles used for babbling and talking. A free-flow, plastic cup is the ideal, often cheaper choice. Examples of suitable cups are shown in *Figure 3*.

Iron deficiency anaemia
In the UK, the proportion of children with haemoglobin concentrations and serum ferritin concentrations below which iron deficiency is indicated is 3% for those aged five to 11 months and 2% for those aged 12 to 18 months (DH, 2011). Iron deficiency anaemia is associated with growth problems and poor child development in infants and poor cognition, certainly in school-aged children. Observational studies support associations between prolonged bottle feeding, excessive milk intake and iron deficiency anaemi (Sutcliffe *et al* 2006; Bonuck *et al*, 2002; Brotanek *et al*, 2005).

Bottle or cup use is significantly associated with the daily volume of milk consumed (Sutcliffe *et al*, 2006). A majority (67%) of bottle-fed children and 32% of cup-fed children consumed more than 16oz (c. 480ml) of milk per day. At all volumes of milk consumed, bottle-fed children had an increased probability of iron depletion compared with cup-fed children, beginning after the age of 16 months (*Figure 4*). In the second and third years of life, there was an almost a two-fold association between iron depletion and daytime bottle-feeding compared with cup feeding (Sutcliffe *et al*, 2006).

Excessive volumes of milk can limit an infant's appetite and so may limit their intake of iron-rich foods. An open cup should fully replace a bottle at around one year of age to help establish a good eating pattern and limit excess milk. Milk intake at one year of age should be about 300ml full-fat milk per day, or the equivalent in calcium-providing yoghurt and cheese. Good sources of iron-containing foods such as red meats, beans, pulses and green vegetables should also be promoted.

Links with obesity
Data from the National Child Measurement Programme (NCMP) in England in 2013-14 shows that, in reception children (ages four to five years), over a fifth (22.5%) of the children measured were either overweight or obese. This was higher than in 2012-13 (NCMP, 2014).

Over the last decade there have been a number of studies showing that a prolonged use of bottles and excessive intake of liquids, including milk is emerging as a risk factor for overweight and obesity in young children (*Figure 5*). Each additional month of bottle use has been shown to correspond to a 3% increase in the odds of being a higher body mass index (BMI) category (Bonuck *et al*, 2004).

It appears that advising parents and carers on the use of an open cup for infants and transfer from a bottle by the age of one year can help avoid prolonged bottle-feeding and excessive liquid intake, and reduce the risk of overweight and obesity.

Over a fifth of reception children in England are overweight or obese

Early interventions

Globally, targeted parental campaigns have been shown to be largely successful in reducing baby bottle use and stimulating a switch to drinking from cups at an appropriate earlier age. (Koelena *et al*; 2000; Davies *et al*, 2005; Maguire *et al*, 2010; Bonuck *et al*, 2014). Studies have not yet shown that these reductions translate into reduced risks of iron deficiency anaemia, obesity or overweight. ECC, however, has shown reductions through cessation of bottle use at one year and use of non-sugar containing drinks (milk and water).

Current UK guidance on introducing a cup

While it is laudable that there is current UK guidance on introducing a cup (see Figure 1), the information given is brief and excludes common issues such as the number of parents that use a bottle alongside a cup, other commonly provided drinks (e.g. sweetened and flavoured milks, squashes) and whether a lid should be used with a cup.

To address these issues, The Public Health Nutrition Network (PHNN), a Specialist Group of the British Dietetic Association (BDA) has reviewed the current evidence around introducing cups and has produced practical recommendations to extend government-based guidance (*Figure 6*).

Professionals that work with families and carers of infants and young children should provide consistent advice on introducing a cup, using the BDA recommendations. The issue should be highlighted at an appropriate time alongside guidance on the introduction of solid foods. For bottle-fed babies, further support in transferring fully to a cup needs to be given as they approach their first birthday. Resources are available for health professionals and parents that reinforce the practical messages. Children's Centres as well as health clinics are appropriate settings for advice and help.

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