The establishment of breastfeeding in the small-for-gestational-age baby

Abstract

Background **Term babies born smaller than expected for a given gestation are at greater risk of short- and long-term health conditions. Breastmilk is the optimum nutrition for all babies and offers specific protection from the risks that follow from being born small for gestational age.**

Aim **To explore breastfeeding outcomes for babies born with a birthweight below the 10th centile.**

Methods **Data were collected on all women giving birth in one maternity unit in the north of England over a year. Method of feeding at three time points was compared between small-for-gestational-age and appropriately grown babies.**

Findings **Small-for-gestational-age babies were significantly less likely to be breastfeeding at discharge from hospital and community services compared to larger babies.**

Conclusion **This study suggests that small-for-gestational-age babies are disadvantaged in establishing breastfeeding.**

Keywords

Breastfeeding | Establishment of feeding | Small for gestational age | Growth restricted

The term small for gestational age (SGA) refers to an infant born with a birthweight 'lower than expected for a given duration of gestation' (Tudehope et al, 2013). More specifically, it applies to babies born with a birthweight below the 10th centile as measured by either a customised or a standard population growth chart (Royal College of Obstetricians and Gynaecologists, 2013). This category may include those babies who are constitutionally small and those whose growth has been restricted due to fetal conditions or as a result of placental insufficiency related to maternal factors, either pre-existing or conditions acquired during pregnancy. It includes babies of low birthweight defined as below 2 500 g which has been the conventional standard used to determine which babies have additional postnatal care requirements, including feeding support.

The recent increased use of the customised growth chart potentially enables a more accurate distinction between those babies who have growth restriction and those who are constitutionally small (Gardosi and Francis, 2009). A range of factors including the mother's height, weight, parity and ethnicity are used to calculate an appropriate weight-range trajectory for each baby. This could result in a 3 kg baby being an average weight for one mother while considered SGA for a different mother.

SGA babies have a range of disadvantages and risks related to in utero events and some may be more physiologically disadvantaged at birth than others.

The British Association of Perinatal Medicine Guidelines (Levene and Wilkinson, 2017) identify babies born below the second population-based centile as amongst those at risk of hypoglycaemia in the postnatal period. These babies would then follow an enhanced postnatal care pathway with additional support to avoid hypoglycaemia and ensure optimal feeding outcomes.

Breastmilk is recognised as the optimum nutrition for babies and exclusive breastfeeding is recommended until six months of age (World Health Organization, 2001). The Baby Friendly Initiative (Unicef, 2013) presents well-documented evidence that breastfeeding reduces the incidence of a range of neonatal infections, including gastroenteritis, respiratory and ear infections, asthma, eczema, and lactose intolerance. It highlights the longer-term morbidities of diabetes, hypertension, obesity and cardiovascular disease amongst babies who have not been breastfed. Breastfeeding has well-known long-term benefits for physical and neurological health (Horta et al, 2007; Quigley et al, 2012). The position papers of the Royal College of Midwives (2018) and the Royal College of Paediatrics and Child

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Health (2018) strongly support breastfeeding as the optimum method of newborn nutrition, promoting the need to provide support to mothers to establish breastfeeding successfully.

The Department of Health (2016) recognises the public health significance of breastfeeding in its document Public Health Framework, where it highlights the need to increase rates of breastfeeding initiation and continuation. The establishment of breastfeeding is part of national and global policy, with breastfeeding advice and support being an integral part of midwifery care in all settings and a clinically relevant outcome for mothers and babies.

The benefits of breastfeeding are clear for all infants but studies have shown that the effects are even greater for the already potentially compromised SGA baby. Rao et al (2002) demonstrated that the effect of exclusive breastfeeding on cognitive development was even greater for those born SGA than those with a weight appropriate for gestational age (AGA). Agostini (2005) showed a similar protective effect of the physical act of breastfeeding and the qualities of breast milk for developmental delay in the SGA infant.

This study investigates the relation between the establishment and continuation of breastfeeding and birthweight centile. It explores breastfeeding initiation and continuation rates for babies who are born at term with a birthweight below the 10th centile but who weigh more than 2 500 gms and therefore are not necessarily included in existing protocols for additional feeding support.

Methods

A retrospective cohort study was undertaken using routinely collected data from one maternity unit in the North of England during 2016 (2 194 births). The study sample comprised all singleton babies born with a gestational age of at least 37 weeks and who weighed 2 500 g or more. Premature babies and those of recognised low birthweight (<2 500 g) were excluded, as the current local unit guidelines already recommend that they follow a specific postnatal care pathway because these factors put them at risk of complications, such as hypoglycaemia.

Data were collected for three time points: mother's feeding intentions at birth, feeding at discharge from hospital, and feeding at discharge from community midwifery services (typically at 10–14 postnatal days). In order to calculate a customised centile for each baby, birthweight, sex, gestation at birth, mothers' ethnicity, parity, height and weight were also collected. Customised birthweight centiles were then calculated using GROW software, version 6.7.8 (Gardosi and Francis, 2016). An SGA baby was defined as below the 10th centile. Further data collected included variables relevant to the establishment of breastfeeding such as body mass index (BMI), method of delivery, and smoking status at delivery.

For our analysis, we divided breastfeeding into two categories of exclusive breastfeeding, for babies fed solely and directly from the breast, and any breastfeeding, which comprised mothers who were exclusively breastfeeding and also those who were supplementing with formula or expressing. We made comparisons between the breastfeeding initiation and continuation rates of SGA babies (who weighed above 2 500 gms) and those who were born with birthweights

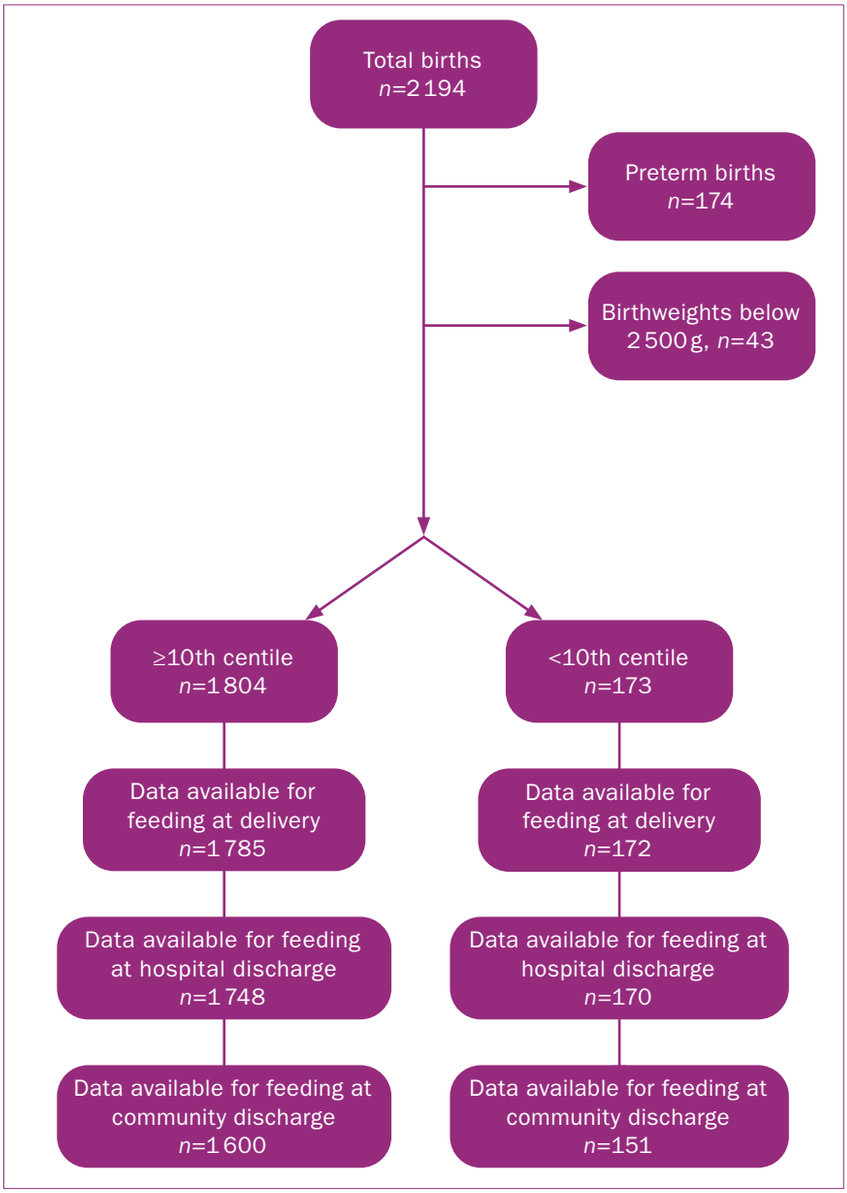

Figure 1. Flow diagram reporting numbers available for analysis according to inclusion criteria, centile and feeding method

Table 1. Demographic variables according to birth centile

	≥10th centile number/1 920 (%)	<10th centile number/274 (%)
Ethnicity*		
White	1 434 (75)	196 (72)
Asian	340 (18)	41 (15)
Other	45 (2)	10 (4)
Parity		
Para 0	701 (37)	105 (38)
Para 1 or more	1 219 (63)	167 (61)
BMI		
≤29	1 445 (75)	199 (73
30–35	326 (17)	44 (16)
>35	135 (7)	27 (10)
Mode of delivery		
SVD	1 245 (65)	172 (63
Instrumental	195 (10)	25 (9)
C/S	480 (25)	77 (28)
Smoking at delivery		
Yes	183 (9.5)	49 (18)
No	1 688 (88)	211 (77)

*Ethnicity: white includes white British (1 620), Irish (8), any other white background (92), Asian includes Pakistani (304) Bangladeshi (52) Indian (18), other Asian background (7); other includes black (8) Chinese (10) mixed (23) any other ethnic background (10)

Table 2a. Exclusive breastfeeding at three time points, according to the babies' weight category

	All babies >2 500 gms n/total (%)	Babies below 10th centile n/total (%)	Babies above 10th centile n/total (%)	Risk ratio (95% CI) SGA: non-SGA
At birth	1 332/1 957 (68%)	106/172 (62%)	1 226/1 785 (69%)	0.90 (0.79, 1.01)
At hospital discharge	1 064/1 918 (55%)	73/170 (43%)	991/1 748 (57%)	0.76 (0.63, 0.91)*
At community discharge	813/1 751 (46%)	57/151 (38%)	756/1 600 (47%)	0.80 (0.65, 0.99)*

*Total changes due to availability of complete data set (*Figure 1*)

above the 10th centile. We analysed these at three times. Statistical analysis was performed using SPSS, version 21 (IBM, 2012). Pearson Chi Square test and, as appropriate Fishers exact test, were used in order to test whether there were differences in breastfeeding between the groups at the three time points.

The main findings are presented as risk ratios (RR) with 95% confidence intervals. A few items of data were missing for each variable; some numbers in the tables thereby fail to add up to the sample totals. Missing data accounted for 1% or less for all variables with the exception of smoking at delivery where data were missing in 3% of records. All retrospective data collected had identifiers removed to make it anonymous, so there was no requirement for either NHS Research Ethics Committee nor Confidential Advisory Group approval.

Results

Of the 2 194 births, 217 babies were excluded as they did not fulfil the inclusion criteria. Of the remaining 1 977, 1 804 (89.12%) babies were on or above the 10th birthweight centile and 173 (10.88%) below. *Figure 1* shows the availability of complete data at the three time points.

There were no substantial differences in terms of ethnicity, parity, mode of delivery and BMI between mothers of babies in the two centile groups (*Table 1*). However, almost twice the proportion of mothers of babies under 10th centile were smoking at time of birth compared to mothers of babies born on or above the 10th centile, risk ratio 1.9 (95% confidence interval 1.4–2.5).

The rates and risk estimate of exclusive breastfeeding between the two groups at the three time points is shown in *Table 2a*. There was a substantial reduction in exclusive breastfeeding rates between birth and time of community discharge in the whole cohort (68%–46%). By the time of hospital discharge, SGA babies were significantly less likely to be exclusively breast-fed than were non-SGA babies (RR 0.76, 95% CI 0.63–0.91). Similarly, at community discharge, SGA babies were significantly less likely to be exclusively breast-fed than were non-SGA babies (RR 0.80, 95% CI 0.65–0.99). Much the same pattern was seen when breastfeeding was analysed according to any breastfeeding rather than exclusive breastfeeding (*Table 2b*). Results were particularly significant for the rates of any breastfeeding at community discharge for the SGA babies compared to non-SGA babies, RR 0.84 (95% CI 0.72–0.98).

Discussion

We found that mothers of full-term babies below the 10th customised centile for birthweight – but not automatically designated at risk on current guidelines

(Levene and Wilkinson, 2017) – were less likely than other mothers to breastfeed their babies. This disparity held true across all three time points and as breastfeeding gradually declined for all babies. These small babies were 24% less likely than larger babies to be exclusively breastfeeding at hospital discharge; at the time of discharge from the care of the community midwife, they were 20% less likely to be exclusively breastfeeding and 16% less likely to be receiving any breast milk at all.

These findings are in line with those of Verd et al (2013) who examined a similar group of babies in relation to their breastfeeding cessation rate. The study was undertaken in a specific population in the Balearics. They employed a population based rather than customised definition of SGA and had a smaller sample size but also found a significant association between early breastfeeding cessation rates and SGA babies. The disparity between SGA and AGA babies fits with our understanding of neonatal adaptation. Soon after birth, neonates undergo a period of metabolic adaptation to enable them to access energy from enteral feeds rather than from continuous trans-placental supply (de Rooy and Hawdon, 2002).

Crucially, in the first few days, ketogenesis enables fat stores to be broken down to provide glucose and ketones as an energy source to counter the normal physiological drop in glucose levels. It has long been known that the SGA baby is less able to mobilise these alternative fuel sources and has lower ketone levels in the early postnatal period (Hawdon and Ward Platt, 1993). SGA babies have proportionally less subcutaneous fat than their counterparts and thereby less access to ketone stores while requiring greater levels of energy to maintain homeostasis. Colostrum is particularly good for increasing ketone levels, so early and effective breastfeeding is protective in terms of glucose and ketone requirements, and provides warmth via frequent skin-to-skin contact—amongst other benefits.

It is possible that SGA babies, with their potentially reduced reserves and energy, may consequently breastfeed less vigorously and effectively. Any subsequent excessive weight loss within the first week may increase maternal anxiety and impact the mother's confidence with breastfeeding, leading to higher rates of breastfeeding cessation or supplementation. A significant proportion of this identified group may be failing to establish breastfeeding because of intrinsic challenges for the SGA baby, potentially compounding the disadvantages of being born small for gestational age with the consequences for their short- and long-term health of reduced breastfeeding duration. Further research is required to explore the factors behind the greater incidence of breastfeeding cessation amongst this group of SGA babies.

Table 2b. Any breastfeeding at three time points, according to the babies' weight category

	All babies >2 500 gms n/total (%)	Babies below 10th centile n/total (%)	Babies above 10th centile n/total (%)	Risk ratio (95%CI) SGA: non-SGA
At birth	1 519/1 957 (78%)	127/172 (74%)	1 392/1 785 (78%)	0.95 (0.86, 1.04
At hospital discharge	1 356/1 918 (71%)	114/170 (67%)	1 242/1 748 (71%)	0.94 (0.85, 1.05)
At community discharge	1 095/1 751 (63%)	80/151 (53%)	1 015/1 600 (63%)	0.84 (0.72, 0.98

Health economic analysis was not within the scope of this study but there will clearly be public health costs in terms of increased infections, asthma and eczema in childhood and consequent hospital admissions, and longer-term with respect to increased risk of diabetes, heart disease and obesity. Pokhrel et al (2015) calculated a saving of £11 million for the NHS in reduced rates of three childhood infections alone if babies had been exclusively breastfed for at least a month.

Strengths and limitations

This is the first UK study to explore breastfeeding outcomes in this specific group of SGA babies. The use of an annual data set with minimal missing data for variables was an advantage which showed few demographic differences between the two groups of babies. Although there was some reduction in the recording of data relating to feeding methods over the postnatal period, we still retained a good sample of 1 700 records to analyse.

These findings arise from a single general hospital site. As far as it was recorded in the NHS records, Asian ethnicity is somewhat higher in the study population than in the UK as a whole. The use of routinely collected data meant that relatively few variables of interest could be captured and analysed; for example, age and socio-economic status could not be retrieved and ethnicity was prone to a shortfall in recording. It was also not possible to determine which babies received routine and which additional postnatal care. Some SGA babies will have been on an enhanced postnatal care pathway, although this will also be true for a proportion of the AGA babies. We also found that there was around a 10% drop in data recording of breastfeeding practice between delivery and discharge from the community midwife's care (*Table 2a, b*).

Key points

- Small-for-gestational-age (SGA) babies are at greater risk of longer term morbidities such as diabetes, cardiovascular disease, obesity and poorer cognitive development
- Breastfeeding is the optimal nutrition for all newborns and offers specific protection against these risks
- There was a substantial reduction in exclusive breastfeeding rates between birth and time of community discharge for all babies
- SGA babies were significantly less likely to be exclusively breastfeeding at hospital or community discharge than other babies

It is known that some women who are at increased risk of a SGA baby, particularly smokers (Flower et al, 2013) and women of lower socio-economic status are also less likely to breastfeed (Oakley et al, 2013). While this study did not adjust for either of these potential confounders, the primary outcome was association between SGA babies and continuation of breastfeeding amongst women who had already chosen to breastfeed rather than factors affecting initiation.

The limitations of the data collection system meant that we were unable to include reliably other relevant variables, such as opioid use in labour, and the presence of co-morbidities, such as diabetes and hypertension. This study could be replicated with a larger sample and over multiple sites to ensure a broader participant demographic and using more identifiable records. Another possibility would be to conduct a prospective study with participant consent and follow-up to ensure that information on all relevant variables was collected. It would also be possible to include other relevant neonatal outcomes, such as episodes of hypoglycaemia and readmission rates. A qualitative element to a study could also explore factors for breastfeeding cessation across the SGA and AGA groups.

Conclusion

This study found that SGA babies were less likely to initiate, establish or continue to breastfeed than larger babies. That a significant fall in breastfeeding rates occurred within the first few days, while still in hospital and with access to professional support should be of particular concern to midwives. While efforts should be put into supporting all women wishing to breastfeed, this group of SGA babies constitutes one at particular risk of short- and long-term health problems which effective breastfeeding could reduce.

Midwives have a professional and public health duty to help address this disadvantageous start for SGA babies. This study is part of an emerging area of research and will add to the wider debate. Further research is required to validate these findings and explore interventions to increase the initiation and duration of breastfeeding for this group of SGA babies. **BJM**

Declaration of interests: *The authors have no conflicts of interest to declare.*

Ethical approval: *Ethical approval was granted by the University of Leeds School of Medicine Research Ethics Committee, HRA approval was subsequently received as was local R&D confirmation to undertake this study at site.*

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CPD reflective questions

- How far do these findings reflect your own clinical experience?
- What are the postnatal clinical pathways for all small-for-gestational-age babies in your unit?
- What interventions might improve breastfeeding success for this group and all other mothers and babies?

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