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Factors affecting the introduction of complementary foods in the preterm infant

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Objectives: The aim of the study was to identify current infant feeding practices among carers of preterm infants.
Design: Structured interviews on milk and complementary feeding practices were conducted with mothers of preterm infants at intervals until infants were 12 months corrected age.
Setting: Recruitment took place in three local Surrey hospitals over a 2 y period.
Subjects: Two-hundred and fifty-three preterm infants (139 male, 114 female) including 33 sets of twins and three sets of triplets were recruited.
Results: Forty-nine percent of the preterm infant group received first solid foods (the commencement of 'weaning') before the current Department of Health (DoH) guideline. The mean $\pm$ s.e.m. weaning age from birth was 17.1 ± 0.23 weeks. Ninety-five percent of the infants were weaned before the DoH guideline when the data was examined from term (mean $11.5 \pm$ s.e.m. 0.21 weeks). Twenty-one percent were weaned before the DoH guideline for preterm infants which is that 'the infant weighs at least 5 kg' (mean $5.61 \pm$ s.e.m. 0.01 kg). Human milk-fed infants were significantly lighter at weaning than combined milk-fed infants (5.32 ± 0.12 *vs* 5.72 ± 0.01 kg; $P < 0.05$) even though they were weaned at a similar age. Infant formula-fed infants (mean weaning age from term 10.2 ± 0.47 weeks) were weaned significantly earlier than both human milk-fed (11.9 ± 0.49 weeks; $P < 0.05$) and combined milk-fed (11.9 ± 0.25 weeks; $P < 0.005$) infants.
Conclusions: The introduction of complementary foods varied widely between carers of preterm infants and compliance with DoH guidelines was poor. Further studies on preterm infants are necessary to see if weaning practices affect long-term growth and morbidity and to provide a basis for the development of appropriate recommendations.
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Introduction

About 5% of babies born in the UK are preterm and the number surviving is increasing as technology advances, as is apparent from the results of a survey in the north of England (Tin *et al*, 1997). The classification 'preterm' includes all infants born before 37 weeks gestation and does not take into account birth weight. This results in a very heterogeneous population.

Guidelines on the introduction of complementary foods for infants are stated in the Department of Health (DoH, 1994) report, *Weaning and the weaning diet*. However, as little information exists on complementary feeding of preterm infants, guidelines for the introduction of foods other than human milk or infant formula in this group are less detailed and giving advice may present difficulties.

The introduction of solid foods to complement human milk or infant formula or both (ie the weaning process), is recognised as one of the most crucial dietary events in an infant's life (Lanigan *et al*, 2001). If the process is begun too early this may cause development of allergic disease or obesity, while if there is a delay, this may induce failure to thrive or iron-deficiency anaemia (DoH, 1994; Wilson *et al*, 1998). These problems could be exacerbated in the preterm

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population because of the infant's immaturity. The DoH report recommends, for the full-term infant, that '*the majority of infants should not be given solid foods before the age of four months*' but acknowledges that weaning a preterm infant may present problems. Should the 4 month guideline be taken from birth or term in the preterm infant? Delaying introduction of complementary foods until 4 months post-term may mean that the infant is consuming human milk or infant formula or both for a long time and could become nutritionally vulnerable. There may also be social pressures on the parents to begin solid feeding sooner in the belief that it will encourage their infant's development. The DoH report recommends the following for preterm infants. '*A reasonable compromise may need to be adopted such that weaning can be advised when the infant weighs at least 5 kg, has lost the extrusion reflex and is able to eat from a spoon.*'

Studies in full-term infants, in Glasgow (Savage *et al*, 1998) and nationally (Foster *et al*, 1997) have shown that compliance with the DoH weaning guidelines is poor. Information is not available on current weaning practices in the preterm infant population in the UK.

This study was part of a large scale observational study which investigated factors affecting allergy development in preterm infants. The aim of this paper is to identify current infant feeding practices and in particular those factors that influence the introduction of complementary foods to a group of preterm infants born in the south-east of England.

Methods

Ethical approval for the study was obtained from appropriate Local Research Ethical Committees. Recruitment took place in three local Surrey hospitals over a 2 y period. A research midwife approached mothers of preterm infants soon after birth and acquainted them with the study. Informed written consent was obtained from the parents who agreed to participate. For the purposes of this study, preterm infants are defined as those born between 27 weeks and 36 weeks + 6 days gestation. All were appropriate-for-gestational-age, ie had a birth weight for age greater than the third centile (Gairdner & Pearson, 1998).

Two-hundred and fifty-three preterm infants (139 male, 114 female), including 34 sets of twins and three sets of triplets, were recruited (three infants, one from each of two sets of twins and one from a set of triplets were small for gestational age and not included in the total number). Detailed structured interviews on socio-economic status, ethnic grouping, maternal age, maternal educational qualifications, parity, milk and solid feeding practices (including questions about the age of the infant when the introduction of complementary foods began, when different foods were introduced and who gave such advice), were administered to the mothers by the research midwives at 1 week after birth, and when the infants were 40 weeks gestational age and 4 and 12 months corrected age. Infants were also weighed at these times using portable calibrated scales using standard anthropometric procedures. Either the 4 month corrected age measurement or the health visitor record was used for weaning weight if either of these was within approximately 1 week of the introduction of solid foods. If not, no weaning weight was recorded. Other anthropometric data were collected (eg length) and the results from this data will be published elsewhere.

Infants were divided into one of three groups based on their milk feeding practices prior to the introduction of complementary foods: *human milk-fed infants* ($n = 59$), who mainly consumed breast milk, either directly from the breast or expressed, until the introduction of complementary foods began (≤ 10 infant formula feeds given prior to the introduction of complementary foods); *infant formula-fed infants* ($n = 60$) who mainly consumed infant formula before the introduction of complementary foods (≤ 10 human milk feeds given prior to the introduction of complementary foods); and *combined milk-fed infants* ($n = 134$), who consumed both human milk and infant formula before the introduction of complementary foods.

The age at which complementary foods were introduced was considered from both birth and term to allow for the degree of prematurity of the infants where term is classified as 40 weeks gestation.

Data was analysed using SPSS for Windows version 7. Groups were compared using the non-parametric Mann–Whitney or Kruskall–Wallis tests. The χ^2 test was used to assess the association between categorical variables. Spearman's rank correlation was used to test the significance of association between variables. Significance was taken at $P < 0.05$.

Results

Subject information

Two hundred and fifty-three infants were recruited into the study. There were 196 singletons, 34 sets of twins and three set of triplets. There were 139 male infants (54.9%) and 114 female infants (45.1%). The mean gestational age was 34.4 ± 1.83 weeks (mean $\pm$ s.d.) with a range of 28–36 weeks. Ninety-five infants in the cohort were born between 28 and 34 weeks gestational age and 158 infants were born between 35 and 36 weeks gestational age. The mean birth weight was 2.34 ± 0.49 kg with a range of 0.96–3.60 kg. All infants recruited onto the study were healthy though premature at birth.

Socio-demographic characteristics

Infants were recruited from families from a cross-section of socio-economic groups (social classification based on father's current or previous occupation; Office of Population Censuses and surveys, 1991). All but one infant (Afro-Carribean) were of white ethnic origin. The mean $\pm$ s.e.m. age of mothers on the study was 31.1 ± 0.33 y. The mean age of first-time mothers ($n = 133$ infants) was 30.0 ± 0.47 y and for

Table 1 The influence of demographic factors on weaning weight, weaning from birth and from term (mean ± s.e.m.)

	Weaning age from birth (weeks)		*Weaning age from term (weeks)*		*Weaning weight[a] (kg)*	
Paternal social class						
I (*n* 38)	18.0 (0.75)	NS	12.3 (0.70)	NS	5.38 (0.16)	NS
II (*n* 100)	17.1 (0.37)		11.5 (0.32)		5.62 (0.01)	
IIIN (*n* 24)	18.0 (0.59)		12.3 (0.60)		5.91 (0.20)	
IIIM (*n* 64)	16.8 (0.40)		11.2 (0.41)		5.62 (0.11)	
IV (*n* 12)	16.2 (0.94)		10.9 (0.85)		5.56 (0.36)	
V (*n* 4)	16.0 (1.91)		9.5 (1.50)		5.56 (0.43)	
Unclassified (*n* 1)	8.0 (-)		4.0 (-)		3.29 (-)	
Armed forces (*n* 9)	16.2 (0.76)		9.8 (0.72)		5.91 (0.43)	
No paternal data (*n* 1)	16.0 (-)		11.0 (-)		6.40 (-)	
Maternal age[b]						
< 30 y (*n* = 59)	15.9 (0.37)	< 0.005	10.3 (0.37)	< 0.005	5.50 (0.13)	NS
≥ 30 y (*n* = 74)	17.9 (0.40)		12.1 (0.36)		5.70 (0.01)	
Maternal highest educational attainment						
Degree or equivalent (*n* = 77)	18.1 (0.42)	NS	12.5 (0.36)	< 0.05	5.71 (0.01)	NS
A-level or equivalent (*n* = 78)	17.0 (0.43)		11.2 (0.41)		5.50 (0.11)	
O-level or equivalent (*n* = 92)	16.5 (0.35)		11.0 (0.33)		5.64 (0.12)	
None (*n* = 6)	15.3 (1.54)		10.3 (1.31)		5.22 (0.53)	
Gender						
Male (*n* = 139)	16.7 (0.32)	NS	11.1 (0.30)	< 0.05	5.67 (0.01)	NS
Female (*n* = 114)	17.6 (0.33)		12.0 (0.29)		5.52 (0.01)	

[a]Weaning weight data only available for 191 infants.
[b]Maternal age analysis confined to primiparous mothers (see text).

second or subsequent births ($n = 120$ infants), 32.4 ± 0.43 y. Sixty-two percent of infants on the study had mothers aged 30 y or older. Thirty percent of infants had mothers with ‘A’ levels or equivalent as their highest educational attainment and 30% of infants had mothers with a degree or equivalent.

There was a wide range in birth weight of infants on the study (mean 2.35 ± 0.01 kg, range 1.09 – 3.56 kg).

Timing of the introduction of complementary foods from birth and term

The mean age from birth of the introduction of solids was 17.1 ± 0.23 weeks; 49% of the sample were weaned before the DoH recommendation of 4 months. When this data were adjusted for the degree of prematurity of the infants, ie examined from term, the mean age was 11.5 ± 0.21 weeks; 95% of the sample were weaned before 17 weeks from term.

Socio-economic classification

There was no effect of paternal socio-economic classification on the introduction of solid foods from term (Table 1). However, when the data was reclassified according to maternal socio-economic status, there was a significant effect ($P < 0.05$), with higher social classes weaning later from birth, eg weaning age for social class I, 20.7 ± 1.4 weeks *vs* social class IIIN, 16.7 ± 0.39 weeks. When the data was classified according to the highest socio-economic class of either parent, there was a trend towards significance with weaning from birth ($P = 0.07$). A similar pattern was seen when weaning age from term was considered (paternal socio-economic class, $P = 0.16$; maternal socio-economic class, $P < 0.01$; family socio-economic class, $P < 0.05$).

Maternal age

Analysis of the effect of maternal age on the timing of weaning (from birth and term) was confined to the infants of first-time mothers ($n = 133$ infants) because the age at a second or later birth is dependent on a number of factors, including number of children and spacing between children. Mothers aged 30 or older weaned their infants significantly later from birth and term than mothers under 30 ($P < 0.005$ and $P < 0.005$, respectively, Table 1).

Maternal education

There was a tendency for the more highly educated mothers to wean their infants at a later age than the rest from birth and term, and this was statistically significant when the data was analysed from term ($P < 0.05$, Table 1).

Gender

Male infants were weaned at an earlier age from birth than females ($P = 0.09$) and this difference was statistically significant when considered from term ($P < 0.05$, Table 1). There was no statistical difference in weaning weight between male

and female infants, indicating that a heavier weight was not the reason for early weaning in male infants. Chi-square analysis showed no association between milk feeding practices and gender.

Gestational age

Infants born more prematurely (gestational age (GA) 28–34 weeks) were weaned at a significantly later age from birth than infants born nearer to term (35–36 weeks GA; $P<0.0001$, Table 2). When the data was analysed from term, the situation was reversed: infants born more prematurely were weaned significantly earlier than infants born nearer to term ($P<0.05$, Table 2). The infants born more prematurely were significantly lighter at birth than the infants born nearer term; mean birth weight 28–34 weeks, 1.97 ± 0.01 kg *vs* 35–36 weeks, 2.58 ± 0.01 kg ($P<0.0001$). There were no differences between the groups in weight at the time of the introduction of complementary foods (Table 2).

Multiple births

The mean birth weight of the triplets was significantly less than either twin ($P<0.01$) or singleton ($P<0.005$) infants (triplets, 1.83 ± 0.01 kg; twins, 2.28 ± 0.01 kg; singletons, 2.40 ± 0.01 kg). Triplets were weaned later from birth than twins ($P=0.05$) and singletons ($P<0.05$), Table 2. There were no statistically significant differences between the triplets, twins and singletons in weight at the time of weaning from term.

Introduction of complementary feeding by birth weight

At the extremes of birth weight the lightest infants (<1.5 kg) were weaned 6 weeks later at a mean age of 21.7 weeks compared with the heaviest infants (>3.0 kg), who were weaned at a mean age of 15.2 weeks ($P<0.0001$, Table 2). However, there was no effect of birth weight on the age of the introduction of complementary foods from term. As birth weight increased, weaning weight increased in parallel; the heaviest infants at birth were the heaviest infants at weaning.

The introduction of complementary foods by weight

Weight at the time of the introduction of complementary foods was obtained for 191 infants (75%) of this preterm sample. The heavier infants (≥5 kg) at weaning were weaned 3 weeks later than the rest, and this was statistically significantly different from birth and term ($P<0.05$ and $P<0.0001$, respectively; Table 2). Twenty-one percent were weaned before the DoH guideline for preterm infants which is that 'the infant weighs at least 5 kg' (mean $5.61\pm$s.e.m. 0.01 kg). The relationship between age (from term) and weight at the time of weaning is given in Figure 1. There was a significant correlation between age and weight at the time of weaning (Spearman's $r=0.314$, $P<0.01$), ie the older the age at weaning, the heavier the babies tended to be.

Milk feeding practices

Infants fed infant formula were no heavier than either human milk- or combined milk-fed infants at birth or at

Table 2 The influence of other factors on weaning weight, weaning from birth and from term (mean ± s.e.m.)

	Weaning age from birth (weeks)		*Weaning age from term (weeks)*		*Weaning weight*[a] *(kg)*	
Gestational age at birth						
28–34 weeks ($n=95$)	18.5 (0.40)	<0.0001	11.0 (0.37)	<0.05	5.54 (0.01)	NS
35–36 weeks ($n=158$)	16.3 (0.26)		11.8 (0.25)		5.65 (0.01)	
Multiple births						
Singletons ($n=179$)	17.1 (0.29)	*Triplets* $P=0.05$ from *twins* and $P<0.05$ from *singletons*	11.5 (0.27)	NS	5.67 (0.01)	NS
Twins ($n=66$)	17.0 (0.41)		11.4 (0.37)		5.48 (0.12)	
Triplets ($n=9$)	18.6 (0.50)		12.0 (-)		5.23 (0.17)	
Birth weight						
<1.5 kg ($n=13$)	21.7 (1.16)	<1.5 kg and 1.5–1.9 kg. ($P<0.0001$) from 2–2.4, 2.5–2.9, ≥3.0 kg	11.5 (1.19)	NS	5.18 (0.35)	2.5–2.9 *vs* 1.5–1.9 kg ($P<0.0001$) 2–2.4 kg ($P<0.01$)
1.5–1.9 kg ($n=40$)	19.3 (0.58)		12.0 (0.56)		5.28 (0.15)	
2.0–2.4 kg ($n=99$)	16.5 (0.32)		11.0 (0.32)		5.51 (0.10)	
2.5–2.9 kg ($n=77$)	16.7 (0.37)		12.0 (0.38)		5.84 (0.01)	≥3.0 *vs* <1.5 kg ($P<0.05$), 1.5–1.9 kg ($P<0.0001$) 2–2.4 kg ($P<0.005$)
≥3.0 kg ($n=24$)	15.2 (0.64)		10.8 (0.67)		6.15 (0.17)	
Weaning weight[a]						
<5 kg ($n=40$)	14.7 (0.55)	<0.05	8.4 (0.54)	<0.0001	—	—
≥5 kg ($n=151$)	17.4 (0.27)		11.9 (0.21)			

[a]Weaning weight data only available for 191 infants.

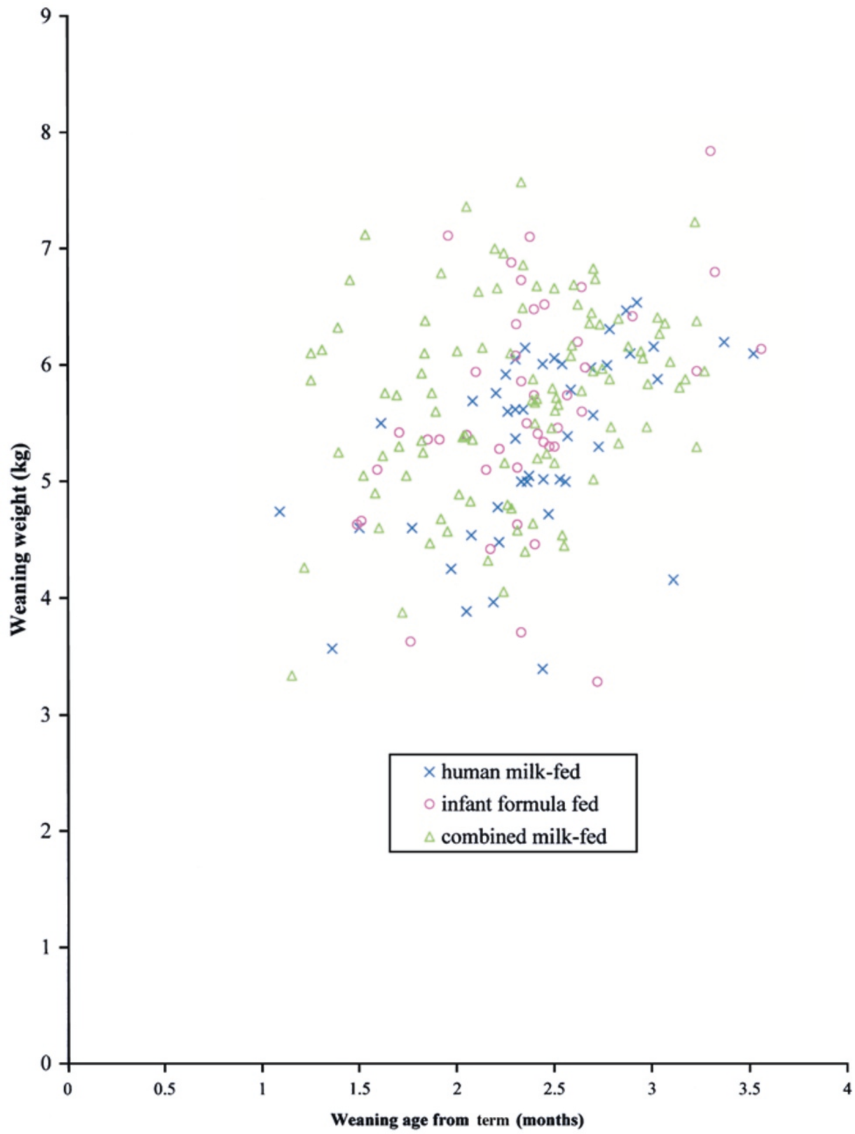

Figure 1 Graph of age from term and weight at weaning by type of milk feeding.

Table 3 Birth weight and weaning age and weight by type of milk feeding (mean ± s.e.m. and range)

Type of milk feeding	*Birth weight (kg)*	*Weaning weight (kg)*	*Weaning age from birth (weeks)*	*Weaning age from term (weeks)*
Human milk-fed infants (*n* = 59[a])	2.44 (0.01, 1.09–3.52)	5.32 (0.12, 3.40–6.54)*	17.4 (0.47, 9–35)[†]	11.9 (0.49, 4–31)[†]
Infant formula-fed infants (*n* = 60[a])	2.39 (0.01, 1.49–3.56)	5.63 (0.15, 3.29–7.84)	15.7 (0.49, 5–24)	10.2 (0.47, 0–17)
Combined milk-fed infants (*n* = 134[a])	2.30 (0.01, 1.15–3.56)	5.72 (0.01, 3.34–7.57)	17.6 (0.30, 9–27)[‡]	11.9 (0.25, 3–19)[‡]
All infants (*n* = 253)	2.35 (0.01, 1.09–3.56)	5.61 (0.01, 3.29–7.84)	17.1 (0.23, 5–35)	11.5 (0.21, 0–31)

Significantly different from combined milk-fed: *$P < 0.05$. Significantly different from formula milk-fed: [†]$P < 0.05$; [‡]$P < 0.005$.
[a]For weaning weight, human milk-fed *n* = 46; formula milk-fed *n* = 43; combined milk-fed *n* = 102.

the time of the introduction of complementary foods, yet they weaned significantly earlier from term than either of the other two groups ($P < 0.05$ and $P < 0.005$, respectively, Table 3). Human milk-fed infants were significantly lighter at the time of the introduction of complementary foods than combined milk-fed, even though they were weaned at a similar age ($P < 0.05$, Table 3). There were no differences in the mean age of the introduction of complementary foods from term between human milk- and combined milk-fed infants.

First solid food

Of the preterm infants, 84.6% were offered baby rice as their first weaning food. Four percent were offered baby cereal, 3.2% rusk, 3.2% pureed vegetables, 2.8% pureed fruit, 1.2% pureed meat and vegetables and 0.8% other dessert. One infant was offered egg custard as its first solid food.

Discussion

This preterm cohort studied in the south-east of England was self-selected and is not representative of the preterm infant population in general. There is no similar national data on preterm infants. The classification 'preterm' includes a very heterogeneous group with a wide birth weight range, however most will be developmentally challenged to some extent, eg poor sucking reflex and reduced liver or respiratory function.

No mother received advice on the introduction of complementary foods whilst in the neonatal unit. Health visitors followed the infants after discharge, many of whom would not have been aware of the effects of prematurity and thus may not have made allowances for this when giving weaning advice.

There was a bias towards recruitment from non-manual social classes (Registrar General's classification I, II and IIIN; Office of Population Censuses and Surveys, 1991); 64% of infants in the current study came from non-manual classes compared with 40% in a national study conducted by the Office for National Statistics (Foster *et al*, 1997). This was probably because of the area (Surrey and Hampshire) in which the subjects' families lived.

A high proportion of infants in the current study had older mothers — 62% had mothers aged ≥ 30 y. The most recent Birth Statistics Series (Office for National Statistics, 1999), which contains data on all births in England and Wales, reported that 43% of mothers nationally and 49% of mothers in the south-east region were ≥ 30 y. Forty percent of mothers in the Infant Feeding 1995 study (Foster *et al*, 1997) were ≥ 30 y. Mothers in the current study were generally well educated with 30% of infants having mothers with a degree or equivalent. This compares with 20% of mothers having a degree in the Infant Feeding 1995 study (Foster *et al*, 1997).

In this study the DoH weaning guidelines have been used for comparison. International guidelines on appropriate complementary feeding practices have been published (eg WHO, 1995) but these are inappropriate to use as a comparison here as they are a guide for the breast-fed full-term infant. Whilst the mean age of the introduction of complementary foods in this group of preterm infants was 17 weeks from birth, in line with the DoH recommendations for the majority of full-term infants, 50% were weaned before this age. When the data was adjusted to allow for the degree of prematurity the mean weaning age was 11.5 weeks corrected age and 95% were weaned before 17 weeks corrected age. This finding is not altogether unexpected, particularly as infants born preterm have very high nutritional requirements per kilogram of body weight. The lack of nutrients supplied by the placenta cannot be matched for the very preterm infants by enteral (ie milk) or parenteral nutrition.

The Infant Feeding 1995 survey reported that 91% of infants nationally and 89% in London and the south-east had received solid food by the age of 4 months (17 weeks). Mills and Tyler (1992), who analysed data from 488 mothers in 1986 (gestational age of infants not specified), found that infants received solids at a mean age of 13 weeks; in the south-east and London region the mean age of solid food introduction was later (mean 14.3 (s.d. 4.7) weeks).

Savage and colleagues reported the median age of solid food introduction in full-term infants living in the Glasgow area was 11 weeks; and only 7% had not been weaned before 4 months of age (Savage *et al*, 1998). The authors reported that younger mothers from a lower socio-economic background tended to introduce solids to their infants at an earlier age.

In the current study group, which was self-selected, there was a high proportion of older, well-educated mothers from non-manual socio-economic class families and we found that mothers from higher socio-economic groupings (based on their own status) weaned their infants at a later age than those from lower groups; this effect was not seen when the data was analysed by the father's social grouping. Clearly this finding has public health implications and highlights the importance of collecting and analysing social data on both the mother and father. Infants in this study were weaned at a later age from birth compared with other published studies on full-term infants and it is possible that both the mother and her health care advisors may take more care in feeding the preterm infant.

The use of age from birth or term (corrected age) to calculate weaning age in preterm infants complicates the interpretation of results. Weight as a measure of when to wean the preterm infant may be more appropriate. However, for the very preterm infants, this could delay the introduction of complementary foods for months and may subsequently lead to later feeding problems (Douglas & Byron, 1996). Twenty-one percent of infants in this study were weaned before 5 kg. Gestational age also affected weaning age from birth and from term. Infants born earlier received solid foods later than infants born at 35 – 36 weeks gestational age; however, they had a significantly lower birth weight, but not weaning weight, than those infants born at 35 – 36 weeks gestational age, presumably because of the extra time taken to begin the introduction of complementary foods.

Infant formula-fed infants were weaned earlier than both human milk- or combined milk-feeders. This influence has been reported in other studies on mainly full-term infants (see, for example, Savage *et al*, 1998). The Infant Feeding 1995 study found that by 4 months 93% of infants fed infant formula had received solid food, compared with 84% of human milk-fed infants. Comparison of weaning

by different milk feeding groups is complicated by the fact that studies use different definitions, particularly for 'human milk'-fed infants. The term has been used to describe infants who received human milk initially or infants who received human milk exclusively. We observed that those infants fed a combination of human milk and infant formula were weaned at a similar age to human milk-fed infants. Human milk-fed infants were significantly lighter at the time of the introduction of complementary foods than the rest. This finding supports that of Dewey *et al* (1992), who investigated growth in full-term infants. They reported that the (mainly) human milk-fed infants gained less weight between 3 and 12 months, than the infant formula-fed infants.

Most infants were offered either non-wheat cereals or pureed fruit or vegetables as their first solid food, in line with the recommendations of the Dott (1994) report. In our study, 85% first received rice, compared with 66% in the Glasgow study, where a greater proportion (14%) of infants received other commercial baby foods as their first food.

It is clear that in this group of preterm infants infant feeding practices varied widely. The sample however is skewed towards the higher social class and older maternal age; it is likely that the true variety in the whole population of preterm infants is even wider. Compliance with DoH guidelines was poor. Further study of these infants for a longer period would allow determination of which practices are most appropriate to ensure adequate growth and development and result in low morbidity. It may be the case that there is no single optimal age for weaning infants. Garza and Frongillo (1998) have highlighted this issue in relation to iron status in full-term human milk-fed infants. A number of factors need to be addressed as they are important in weaning practice guidelines for the full-term infant. These include gestational age and developmental stage of the infant; type of milk feeding; gender; current weight and weight gain of the infant. Furthermore, the nutritional status of the mother during pregnancy and lactation also affects the macro- and micro-nutrient status of the infant.

This study has highlighted the need for the development of practical guidelines on appropriate complementary feeding practices for use by health care professionals and carers of preterm infants.

References

Dewey KG, Heinig MJ, Nommsen LA, Peerson JM & Lönnerdal B (1992): Growth of breast-fed and formula-fed infants from 0 to 18 months: the DARLING study. *Pediatrics* **89**, 1035–1041.

DoH (1994): *Weaning and the weaning diet*. Department of Health. Report on Health and Social Subjects, no. 45. London: HMSO.

Douglas JE & Byron M (1996): Interview data on severe behavioural eating difficulties in young children. *Arch. Dis. Child.* **75**, 304–308.

Foster K, Lader D & Cheesbrough S (1997): *Infant Feeding 1995*. London: Office for National Statsitics.

Gairdner D & Pearson J (1998): *Preterm–2 Y Length/Weight/Head Circumference Growth Chart*. Welwyn Garden City: Castlemead Publications.

Garza C & Frongillo EA (1998): Infant feeding recommendations. [Editorial.] *Am. J. Clin. Nutr.* **67**, 815–816.

Lanigan JA, Bishop JA, Kimber AC & Morgan JB (2001): Systematic review concerning the age of introduction of complemetary foods to the healthy full-term infant. *Eur. J. Clin. Nutr.* **55**, 309–320.

Mills A & Tyler H (1992): *Food and Nutrient Intakes of British Infants aged 6–12 Months*. London: HMSO.

Office for National Statistics (1999): *Birth Statistics*. Series FM1, no. 26, 1997. London: HMSO.

Office of Population Censuses and Surveys (1991): *Standard Occupational Classification*, Vol. 3. *Social Classification and Coding Methodology*. London: HMSO.

Savage S-AH, Reilly JJ, Edwards CA & Durnin JVGA (1998): Weaning practice in the Glasgow longitudinal infant growth study. *Arch. Dis. Child.* **79**, 153–156.

Tin W, Wariyar U & Hey E (1997): Changing prognosis of babies less than 28 weeks' gestation in the north of England between 1983 and 1994. *Br. Med. J.* **314**, 107–111.

WHO (1995): The World Health Organisation's infant feeding recommendation. *WHO Wkly Epidemiol. Rec.* **17**, 117–220.

Wilson AC, Forsyth JS, Greene SA, Irvine L, Hau C & Howie PW (1998): Relation of infant diet to childhood health: seven year follow up of cohort of children in Dundee infant feeding study. *Br. Med. J.* **316**, 21–25.