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Adequacy of Milk Intake During Exclusive Breastfeeding: A Longitudinal Study

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KEY WORDS
exclusive breastfeeding, growth, human milk intake, infant feeding, infant nutrition

ABBREVIATIONS
WHO—World Health Organization
EBF—exclusive breastfeeding
SIMD—Scottish Index of Multiple Deprivation
CI—confidence interval

Drs Reilly and Wells developed the original concept; Ms Nielsen and Drs Reilly, Fewtrell, and Wells developed the study design and methods; Ms Nielsen conducted the research and collected all data; Dr Eaton and Mr Grinham performed isotope analyses; Ms Nielsen, Mr Grinham, and Drs Reilly and Wells analyzed isotope data and interpreted the results; Ms Nielsen prepared all drafts of the manuscript; and all the authors reviewed drafts of the manuscript. The authors had full access to all of the data, and Ms Nielsen takes responsibility for the integrity of the data and the accuracy of the data-analysis.

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WHAT'S KNOWN ON THIS SUBJECT: The World Health Organization recommends exclusive breastfeeding to 6 months, but this practice is rare. Exclusive breastfeeding often ceases because of a perceived insufficient milk supply, and there are concerns over whether exclusive breastfeeding is adequate to fulfill energy requirements to 6 months.

WHAT THIS STUDY ADDS: When well supported mothers follow World Health Organization recommendations, infant milk intake is high and increases significantly over time, fulfilling infant energy requirements during normal growth. There was no evidence of insufficient milk supply during 6 months of exclusive breastfeeding.

abstract

OBJECTIVE: To test whether and how human lactation and breastfeeding practices can adapt to fulfill infant energy requirements during exclusive breastfeeding for 6 months.

METHODS: The First-Feed study was a longitudinal, observational field study to measure milk intake, energy intake (from the doubly labeled water method), anthropometry, and breastfeeding practices at 2 time points around 15 and 25 weeks of age. Fifty healthy exclusively breastfeeding mother-infant dyads were included from breastfeeding support groups in greater Glasgow, Scotland. Forty-seven completed (23 boys), and 41 were exclusively breastfed to 25 weeks of age.

RESULTS: Milk intakes were higher than literature values (923 [SD: 122] g/day, $n = 36$; and 999 [SD: 146] g/day, $n = 33$) at both 15 and 25 weeks of age (both $P < .001$) and increased significantly between time points (mean increase: 61 g/day [95% confidence interval: 23–99]; $P = .003$). Infant growth was normal compared with World Health Organization Child Growth Standards, and energy intakes were adequate compared with references for energy requirements. Behavioral data indicated no evidence of strain on breastfeeding practices.

CONCLUSIONS: Results of this prospective study reveal that when mothers are well supported and follow the World Health Organization recommendation on breastfeeding, milk intakes are high and increase over time, and there is adequate energy intake, normal infant growth, and no marked changes in breastfeeding practices. This new empirical evidence on adaptations during exclusive breastfeeding should help health professionals promote the initiation, duration, and exclusivity of breastfeeding. *Pediatrics* 2011;128:e907–e914

The World Health Organization (WHO) recommends exclusive breastfeeding (EBF) for 6 months,[1] with EBF defined as giving only breast milk with allowance for oral rehydration, and vitamins, minerals, and/or medicines.[2] Despite many benefits, EBF to 6 months remains rare.[3] Even where initiation rates have improved, duration and exclusivity have not followed.[4] Breastfeeding in healthy dyads often meets problems,[5] and 1 common reason for cessation of EBF is maternally perceived insufficient milk supply.[6]

A systematic review of studies mainly using the test-weighing method indicated a sufficient milk energy intake during EBF at 3 to 4 months,[7] but at 6 months of age energy intake from EBF seemed insufficient compared with references for energy requirements.[8,9] The longitudinal studies indicated no marked increase in milk intake beyond 3 to 4 months of age. The test-weighing method involves weighing the infant before and after feeds and correcting for insensible water loss.[10] This method can be accurate, but imprecise in situations with frequent feeds, where the amount of milk consumed is small relative to the sensitivity of the scale.[11,12] There might be a risk of under-reporting in field studies, where the mother records all weight measurements pertaining to each breast feed, whereas isotopic methods do not depend on the mother to record any measurements. The available evidence on EBF from the developed world at 6 months is scarce and only cross-sectional.[7] Although studies in the physiology of lactation[13–15] demonstrate the lactational adaptive response to an increase in demand,[13] this was not in infants EBF to 6 months. The energetic and behavioral means by which EBF is achieved to 6 months are therefore unclear. The aim of the present study was to use isotopic techniques in a longitudinal design to identify how EBF to 6 months is achieved in mothers determined to follow the WHO recommendation by (1) quantifying milk and energy intake for up to 6 months EBF, (2) testing if infant milk intake during EBF to 6 months changes over time, (3) testing adequacy of energy intake and growth, and (4) exploring concomitant changes in breastfeeding practices (breastfeeding frequency and duration of breastfeeds).

METHODS

Study Design and Participants

The First-Feed study was a longitudinal observational study with participants recruited from breastfeeding support groups in Glasgow, Scotland, from May 2007 to October 2008. Scottish EBF rates in 2008 were 37% at initiation (7–10 days postpartum) and 27% at 6 to 8 weeks postpartum,[16] among the lowest in Europe.[17] Sixty mothers were recruited and given oral and written information on the study, if they were EBF, as defined by the WHO, and intended to continue with EBF to 6 months. Other eligibility criteria were born at >37 weeks' gestation, singletons with a birth weight of >2500 g, and no significant disease in mother or infant. Exclusion criteria were any illness in mother or infant that affected breastfeeding or infant growth. Mother-infant pairs were included for the first time point around 15 weeks, if they were still EBF ($n = 50$), and followed up to 25 weeks (Fig 1). All measurements took place during home visits. The study was approved by the National Health Service Research Ethics Committee (ref No. 07/S0701/15), and all mothers gave written informed consent to participation.

Anthropometry

Infant growth was measured on a digital scale (Seca 835 [Numed, Sheffield-,United Kingdom]) and expressed as *z* scores relative to the WHO Child Growth Standards.[18] Length was measured to the last completed millimeter on a measuring board (Kiddimetre [Raven Equipment, Castlemead, United Kingdom]).

Lactational Energetic Measures: Milk and Energy Intake

The doubly labeled water method was used to measure milk intake, energy intake, and milk energy content.[19] The method has been validated against indirect calorimetry in hospitalized preterm infants[20] and postsurgical term infants.[21]

Doubly labeled water was purchased as mixed sterilized > 99.9 atom% ^2H_2O and 10.40 atom% $H_2{}^{18}O$ (Rotem Industries Ltd, Beer Sheva, Israel) and dosed at 2.6 g/kg bodyweight. The measurement involved a predose visit (day −1), a dosing visit (day 0), and a postdose visit (day 7). At the dosing visit, doubly labeled water was administered to the infant orally through a 5 mL syringe, a feeding tube or in the infant's feeding bottle.[22] The amount of dose consumed was determined using preweighing and postweighing of dosing equipment on a precision scale (Sartorius Basic, model BA 310P [Sartorius Goettingen, Germany]). Urine samples were collected by placing cotton wool in the nappies[23] on days −1 and 0 (predose) as well as days 1, 2, 6, and 7 (postdose). The researcher demonstrated the first predose urine sampling so that the mother could perform urine sampling subsequently. Urine samples were analyzed for background abundance and isotope elimination by isotope ratio mass spectrometry.[24] Isotope elimination rates and carbon dioxide production rate (rCO_2) were calculated by the plateau method[25,26] by using a precoded spreadsheet[12] as $rCO_2 = [(N_0 \times k_0)/(2 \times f_3)] - [((N_D \times k_D) \times ((x \times f_2) + 1 - x))/(2 \times f_3 \times ((x \times f_1) + 1 - x))]$,

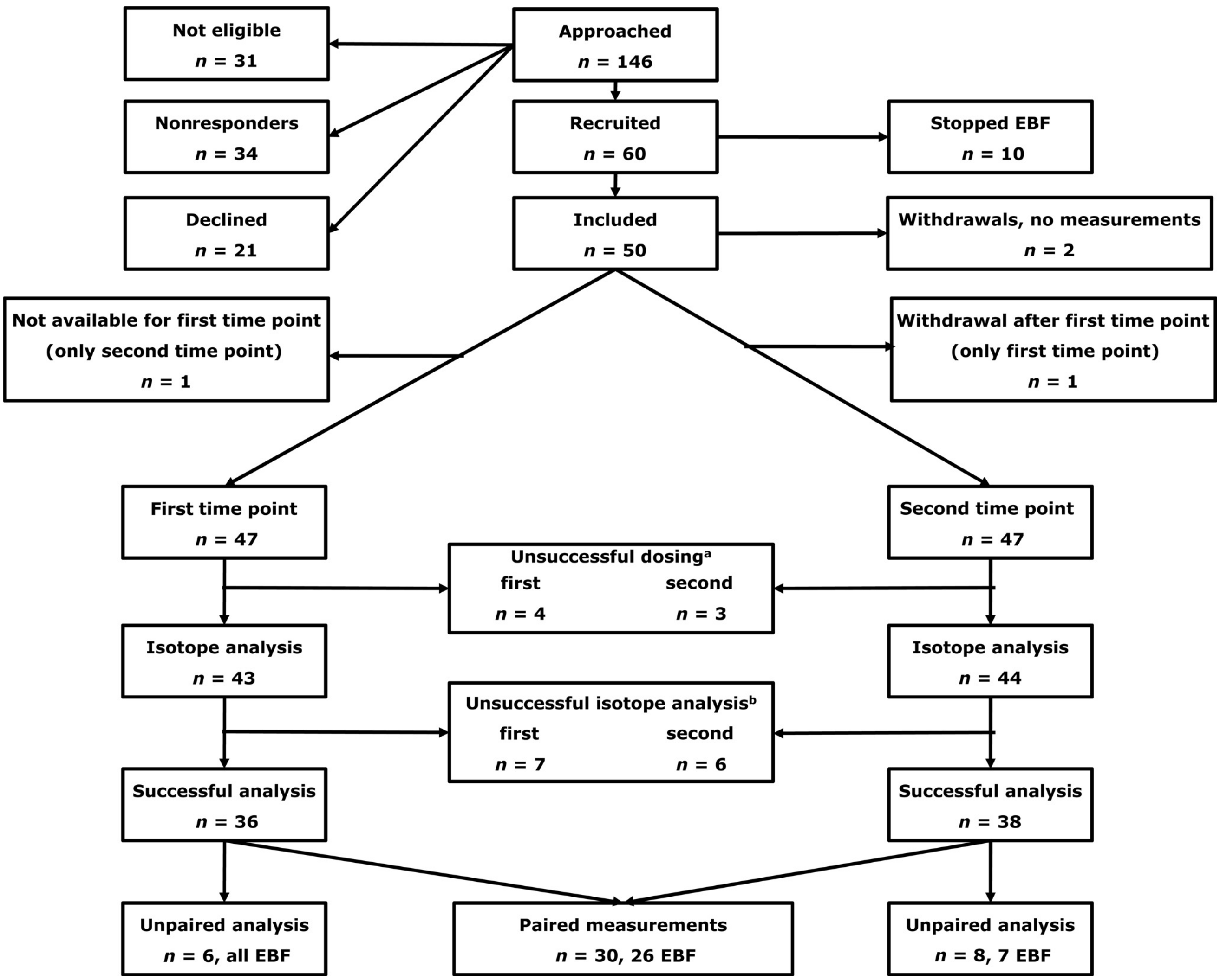

FIGURE 1

Flowchart of participants and samples. [a] Unsuccessful dose administration: dose could not be given because of infant uncooperativeness or infant had reflux and an unquantifiable amount of doubly labeled water was lost. [b] Unsuccessful isotope analysis: quality criteria of isotope space ratio within 1.010 and 1.090 and estimated error on total energy expenditure <10% were not fulfilled.

where N_O and N_D are the oxygen and deuterium dilution spaces, respectively; k_O and k_D are the oxygen and deuterium rate constants, respectively; f_1 is the fractionation factor for deuterium between vapor and liquid (0.93); f_2 is the fractionation factor for 18-oxygen between vapor and liquid (0.99); f_3 is the fractionation factor for 18-oxygen between carbon dioxide and water (1.04); and x is the proportion of water fractionated (assumed to be 0.15). Oxygen consumption was predicted from rCO_2 by using a respiratory quotient of 0.85. Total energy expenditure was calculated using Weir's equation.[27] To ensure that only high quality isotopic data were included in the results, isotope space ratio had to be between 1.010 and 1.090, and estimated total error on energy expenditure had to be <10% (Fig 1). Energy deposited in growth (kJ/day) was calculated from weight gain over the week of urine sampling, using the data on body composition corrected for gender- and age-specific changes in body composition and hydration of lean mass[26] as described previously.[28] Total energy intake (kJ/day) was derived as total energy expenditure plus energy deposited in growth. The elimination rate of deuterium was used to determine milk intake (g/day), correcting for insensible water influx[10]: milk intake (g/day) $= [0.88(N_D \times k_D/f_1)]/0.96$. Milk energy content was calculated as total energy intake divided by milk intake (kJ/g).[19]

Behavioral Measures: Breastfeeding Questionnaires and Infant Behavior Diaries

On day −1, the mothers completed a 26-item questionnaire, adapted from the Infant Feeding Practices Study II,[29] regarding perceived breastfeeding practices, attitudes to infant feeding, and support. On days 3 to 5, the mothers completed an infant behavior diary, previously validated by Barr et al.[30] This diary consisted of 3 consecutive 24-hour periods, where mothers recorded infant's behavior to the nearest 5 minutes in categories (sleeping, feeding, fussy, crying, awake, and content or awake and active). The questionnaires and diaries were used to determine perceived and recorded breastfeeding frequencies and duration of breastfeeds, respectively.

Statistical Methods and Study Power

Primary outcome measures were milk intakes and changes between the time points. A power calculation on the basis of a systematic review of cross-sectional data[7] suggested that 14 dyads with repeated measurements would be sufficient to detect a change in milk intake of 115 g/day (SD: 87) between time points with power 0.90 at significance $P < .05$. To allow for withdrawals/unsuccessful measurements, 60 dyads were recruited. Milk and energy intakes were compared with literature values using 1-sample *t* tests. Changes in milk intake between time points were assessed with a paired *t* test, and gender differences using independent *t* tests. All other outcomes were tested for change over time using paired *t* tests, or Wilcoxon tests, as appropriate. Participants were characterized for sociodemographic factors (Scottish Index of Multiple Deprivation [SIMD], decile; where decile 1 most deprived), maternal age, height, and BMI.

RESULTS

Characteristics of Study Participants

A flowchart of participants is shown in Fig 1. The SIMD decile median was 8 (range: 2–10) for all included participants ($n = 50$). Thirty-five (70%) were primiparous, and the majority (45, 90%) were white European. Mean maternal age was 33.7 (SD: 4.3) years and height and BMI were 165.0 (SD: 7.5) cm and 25.0 (SD: 3.9) kg/m^2, respectively.

The mean interval between the first and second time points was 9.2 (SD: 1.7) weeks ($n = 46$). Forty-seven mother-infant dyads completed the study; 41 were still EBF as defined by WHO at the second time point. Four had just started introducing complementary foods, mainly as puréed fruit (10–25 g/day as measured from preweights and postweights of food containers and bibs on a digital scale by the mother), and 2 had introduced complementary foods when the infants were around 20 weeks of age. All mothers reported a perception of the infant "being ready for solids" as the reason to introduce complementary foods. No infants were receiving infant formula. These 6 dyads were not significantly different from the EBF dyads in terms of SIMD decile, maternal age, height, BMI or infant birth weight, infant weight at the first or second time point, or milk intake at the first time point (all $P > .05$). There were no differences in milk intake, energy intake, or milk energy content between EBF infants and those who received complementary foods at the second time point (all $P > .1$).

Infant growth data are listed in Table 1. The infants showed normal growth relative to the WHO Child Growth Standards. Mean infant age was 15.4 (SD: 1.3) and 24.5 (SD: 1.3) weeks at the first and second time point, respectively. Mean infant weight at the first time point was 6.72 (SD: 0.78) kg and 6.30 (SD: 0.64) kg for boys and girls, respectively. At the second time point, infant weight was 7.84 (SD: 0.91) kg for boys and 7.37 (SD: 0.75) kg for girls.

Energetic Measures: Intakes of Milk and Energy

As shown in Fig 1, 36 and 38 of 47 measurements were successful at the first and second time points, respectively, 7 data points were lost because of unsuccessful dosings (infants not able to consume the doubly labeled water or having reflux), and 13 data points were lost because of analytical problems. This resulted in 30 paired measurements. Four of these had introduced complementary foods at the second time point, leaving 26 paired measurements of EBF infants available for analysis of changes in milk intake between time points (Table 2).

Mean milk intake was 923 (SD: 122) g/day at the first time point ($n = 36$ EBF

TABLE 1 Infant Age and Weight-for-Age, Length-for-Age, BMI-for-Age, and Weight-for-Length *z* Scores Relative to WHO Child Growth Standards

	First Time Point, Mean (SD)			Second Time Point, Mean (SD)		
	Boys ($n = 24$)	Girls ($n = 25$)	All ($n = 49$	Boys ($n = 23$)	Girls ($n = 24$)	All ($n = 47$)
Infant age, wk	15.1 (0.9)	15.6 (1.5)	15.4 (1.3)	24.6 (1.3)	24.5 (1.4)	24.5 (1.3)
Weight-for-age *z* score	0.01 (1.05)	0.11 (0.81)	0.06 (0.93)	0.01 (1.11)	0.21 (0.87)	0.11 (0.99)
Length-for-age *z* score	−0.15 (1.05)	0.21 (0.91)	0.03 (0.99)	−0.41 (1.02)	0.02 (0.95)	−0.19 (1.00)
BMI-for-age *z* score	0.13 (1.10)	0.00 (0.90)	0.06 (0.99)	0.33 (1.06)	0.27 (0.84)	0.30 (0.95)
Weight-for-length *z* score	0.19 (1.10)	0.04 (0.93)	0.11 (1.01)	0.42 (1.05)	0.36 (0.84)[a]	0.39 (0.93)[b]

[a] Significantly greater than 0 (1-sample *t* test, $P = .04$).
[b] Significantly greater than 0 (1-sample *t* test, $P = .007$).

TABLE 2 Milk Intake, Milk Energy Content, and Energy Intake of All Infants and EBF Infants Only

	All Infants						EBF Infants			
	First Time Point		Second Time Point		Difference		Second Time Point		Difference	
	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*
Milk intake, g/d										
Boys	949 (96)	17	1055 (118)[a]	18	108 (81)[c]	15	1050 (125)	16	96 (81)	13
Girls	901 (140)	19	945 (144)	20	23 (97)	15	952 (153)	17	27 (95)	13
All	923 (122)	36	997 (142)	38	65 (98)[d]	30	999 (146)	33	61 (93)[e]	26
Milk energy content, kJ/g										
Boys	2.74 (0.38)	17	2.61 (0.38)	18	−0.12 (0.54)	15	2.60 (0.40)	16	−0.12 (0.59)	13
Girls	2.71 (0.39)	19	2.63 (0.43)	20	−0.05 (0.36)	15	2.60 (0.46)	17	−0.11 (0.36)	13
All	2.72 (0.38)	36	2.62 (0.40)	38	−0.09 (0.46)	30	2.60 (0.43)	33	−0.12 (0.48)	26
Energy intake, kJ/d										
Boys	2582 (362)	17	2748 (480)[b]	18	182 (572)	15	2725 (500)	16	143 (607)	13
Girls	2403 (215)	19	2449 (312)	20	41 (395)	15	2437 (334)	17	8 (386)	13
All	2487 (303)	36	2590 (423)	38	111 (488)	30	2577 (441)	33	75 (503)	26

[a] Difference between genders in milk intake at second time point (all infants), $P = .015$ (independent *t* test).
[b] Difference between genders in energy intake at second time point (all infants), $P = .028$ (independent *t* test).
[c] Difference between genders in change in milk intake (all infants), $P = .015$ (independent *t* test).
[d] Difference between time points in milk intake (all infants), $P = .001$ (paired *t* test).
[e] Difference between time points in milk intake (EBF infants), $P = .003$ (paired *t* test).

infants; 17 boys), significantly higher than literature values of 779 g/day at 3 to 4 months[7] (mean difference: 144 g/day [95% confidence interval (CI): 103–186]; $P < .0001$). At the second time point, milk intake was 999 g/day (SD: 146 g/day) ($n = 33$ EBF infants; 16 boys), which was also significantly higher than literature values of 894 g/day at 6 months[7] (mean difference: 103 g/day [95% CI: 56–150]; $P < .0001$). The mean difference in milk intake between time points was 61 g/day (95% CI: 23–99; $P = .003$) for EBF infants only ($n = 26$). The mean weekly increase in milk intake over the study period was 6.0 g/week (SD: 11.0 g/week) ($P = .009$). When energy intakes were expressed per kg body weight (Table 3), they were not significantly different from the WHO reference for energy requirements of 328 kJ/kg per day for breastfed infants[9] at 6 months (mean difference: 15 kJ/kg per day [95% CI: −2.6–33]; $P = .091$). In general, boys tended to have higher intakes of milk and energy at both time points, but when the variables were expressed per kg body weight, the differences were small and not significant. Milk energy content was 2.72 and 2.60 kJ/g at the first and second time point, respectively, which is similar to what was found in the systematic review by Reilly et al,[7] where milk energy content was mainly determined from bomb calorimetry or direct measurements of energy-yielding nutrient content. Milk energy content did not change significantly between time points and was not significantly different between the genders.

Behavioral Measures: Breastfeeding Practices and Infant Behavior

Feeding frequency and duration of breastfeeds are summarized in Table 4. The questionnaire and diary data suggested very small and insignificant changes in feeding frequency from the first to second time point. The average time spent on breastfeeding per day and per feed decreased significantly from the diary data (paired *t* test), and the questionnaire data showed a similar trend.

TABLE 3 Milk and Energy Intake per kg Body Weight for All Infants

	First Time Point		Second Time Point		Difference		
	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	*P*[a]
Milk intake, g/kg times day							
Boys	142 (12)	17	135 (14)	18	−6 (10)	15	.043
Girls	143 (21)	19	129 (16)	20	−15 (14)	15	.001
All	142 (17)	36	132 (15)	38	−11 (13)	30	<.001
Energy intake, kJ/kg times day							
Boys	385 (41)	17	353 (67)	18	−28 (79)	15	.190
Girls	381 (30)	19	335 (40)	20	−46 (57)	15	.007
All	383 (35)	36	343 (55)	38	−37 (68)	30	.006

There were no significant differences between genders.
[a] Difference between time points (paired *t* tests).

TABLE 4 Breastfeeding Frequency and Duration of Breastfeeds as Reported From Questionnaires and Recorded Through Infant Behavior Diaries

	First Time Point Frequency or Median (Range)	n	Second Time Point Frequency or Median (Range)	n	P[a]	n
Questionnaire data		47		45		
Average duration of feed					<.001	
<10 min per feed	7		11			
10–19 min per feed	14		16			
20–29 min per feed	16		13			
30–39 min per feed	6		4			
40–49 min per feed	2		1			
>50 min per feed	2		0			
Feeding frequency, feeds per 24 h	8 (5–12)	44	7 (4–20)	44	>.05	39
Behavior diary data						
Feeding frequency, feeds per 24 h	8 (5–15)	43	9 (5–15)	41	>.05	37
Duration of breastfeeding, min per 24 h	173 (70–335)	43	140 (75–293)	41	<.001	37
Duration of a feed, min per feed	20 (6–46)	43	16 (8–33)	41	.002	37

[a] Differences between time points tested with χ^2 test for questionnaire data and Wilcoxon signed rank test for diary data.

DISCUSSION

The present study was the first to use a state-of-the-art technique to investigate longitudinal adaptations by mothers and infants who were EBF as defined by the WHO to 6 months of age. Milk intake during EBF was higher than literature values,[7] and it increased significantly over time, an adaptation not described previously.[8] Infant energy intake was comparable to the WHO reference for energy requirements,[9] and infant growth was normal relative to the WHO Child Growth Standards, which describe optimal growth during infancy.[18] Finally, questionnaires on maternal perception of breastfeeding, as well as maternal records of infant behavior did not indicate any increase in the behavioral demands of EBF, manifest as more frequent feeds or more time spent on breastfeeding. All these results support the view that EBF to 6 months is not constrained by maternal physiology,[13–15] and that mothers can accommodate EBF to 6 months by high and increasing milk outputs, with minimal behavioral changes and normal infant growth.

Milk Intake Differs According to Design and Methodology

A possible explanation for the higher observed milk intakes in the present study compared with the literature is the use of different designs and methodologies. Firstly, the current evidence from the developed world on milk intake in EBF infants at 6 months of age is cross-sectional. This incurs a risk of sample selection bias, as high infant weight is a well known confounder for early complementary feeding.[31,32] Cross-sectional studies at 6 months might be selection biased in a way that provides lower estimates of milk intake. Secondly, literature values were based largely on the test-weighing method, and this method gives lower estimates of milk intake compared with an isotopic method.[7,12,33–35] Reilly et al[7] found a mean difference in milk intake between the test-weighing method and the isotopic methods of 66 g/day (95% CI: 11–123 g/day; $P = .02$). The test-weighing method might be prone to imprecision in situations of frequent feeding[11,12] and involves a risk of underreporting in field studies, which isotopic methods avoid because they do not require the mothers to record any measurements. In addition, precision is improved in the isotopic methods by providing an average measurement over a period of 7 days, whereas test-weighing is typically conducted over 24 hours.

Strengths and Limitations

In the present study, participants were relatively affluent, with a relatively high age for their parity status: this could not be avoided because these are characteristics of mothers who attempt EBF to 6 months.[36] The high cessation rate of EBF before inclusion (10/60 recruited dyads) is typical because <1% of United Kingdom mothers practice EBF to 6 months.[3] The present study possibly benefitted from an intervention effect, increasing the motivation to persevere with EBF to 6 months; 82% (41/50 included mothers) succeeded. However, the effects of high socioeconomic status and study participation were purely behavioral, whereas the primary outcome measures were physiologic adaptations to EBF to 6 months.

Implications for the Promotion of Breastfeeding

Initiation of EBF remains low in many parts of the world,[37] and EBF according to the WHO recommendation is still rare.[3,4] Many factors contribute to early introduction of complementary feeding,[32,36] but the perception of insufficient milk supply remains a crucial issue to deal with if EBF toward the WHO recommendation is to be achieved.[6,38] Moreover, the response of health professionals to perceived breast milk insufficiency can often be detrimental to breastfeeding (eg, recommending that mothers "top up" with formula).[38,39] One review on perceived insufficient milk supply found no studies that linked this perception to inadequate milk energy supply from EBF.[6] The present study also provided no indication that following the WHO recommendation was associated with insufficient milk supply, and the adequacy of EBF was further confirmed through normal infant growth because growth is a sensitive indicator of whether energy needs are met.[40]

The extent to which socioeconomic circumstances are associated with the energetics of lactation, or of infant energy requirements, remains unclear but will be important for the generalizability of the present study. In Brazil, infants of lower socioeconomic status families had 24% higher total energy expenditure, mainly caused by higher activity energy expenditure, than did infants from higher socioeconomic status families.[41] This does not mean that EBF is not possible in all groups, but the constraints against EBF will vary with provenance, degree of affluence and other sociocultural factors, and these constraints need to be better understood if higher rates of EBF are to be achieved. In a large cluster randomized controlled trial in India it was demonstrated that community-based promotion of exclusive breastfeeding was highly successful in achieving higher rates of exclusivity and duration of breastfeeding, even with under-nourished mothers.[42] The behavioral ease with which mothers in the present study seemed to achieve EBF to 6 months offers some hope that more mothers might achieve EBF for a longer duration in the future if sufficient breastfeeding support is available. Future studies can focus on how to improve support for increases in duration and exclusivity of EBF.

CONCLUSIONS

When mothers are supported and follow the WHO recommendation, milk intakes are high and increase throughout time to meet infant energy requirements during EBF to 6 months, and this can be achieved without major constraints on breastfeeding practices. Additional work would be required to determine the generalizability of these data to all populations. However, this new evidence should be helpful in the promotion of greater duration and exclusivity of breastfeeding in future.

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