Early Initiation of Breastfeeding and the Risk of Infant Diarrhea in Rural Egypt

John Clemens, MD*; Remon Abu Elyazeed, MD, PhD‡; Malla Rao, MEngg, MPH*; Stephen Savarino, MD‡;
Badria Z. Morsy, MBBCh§; Yongdai Kim, PhD*; Thomas Wierzba, PhD‡;
Abdollah Naficy, MD, MPH*; and Y. Jack Lee, PhD*

ABSTRACT. *Background.* **Initiation of breastfeeding shortly after delivery may enhance breastfeeding's protective effect against diarrhea because of the protective properties of human colostrum contained in early breast milk.**

Objective. **To evaluate whether initiation of breastfeeding within the first 3 days of life, when breast milk contains colostrum, was associated with a lower rate of diarrhea in rural Egyptian infants during the first 6 months of life.**

Methods. **Infants initially breastfed (*n* = 198) were monitored prospectively with twice-weekly home visits to ascertain dietary practices and diarrheal illnesses.**

Results. **The burden of diarrhea during the first 6 months of life in the cohort was high: seven episodes per child-year of follow-up. Only 151 (76%) infants initiated breastfeeding during the first 3 days of life ("early initiation"). Infants in whom breastfeeding was initiated early had a 26% (95% CI: 2%,44%) lower rate of diarrhea than those initiated late. The protective association between early initiation and diarrhea was independent of the pattern of postinitiation dietary practices and was evident throughout the first 6 months of life.**

Conclusions. **Early initiation of breastfeeding was associated with a marked reduction of the rate of diarrhea throughout the first 6 months of life, possibly because of the salutary effects of human colostrum. These data highlight the need for interventions to encourage early initiation of breastfeeding in less developed settings.** *Pediatrics* **1999;104(1). URL: http://www.pediatrics.org/cgi/content/full/104/1/e3;** *breastfeeding, colostrum, diarrhea, Egypt.*

ABBREVIATIONS. GEE, generalized estimating equation; OR, odds ratios.

Breastfeeding of infants living in developing countries has been documented to reduce their risk of diarrhea.[1,2] In addition, ingestion of maternal colostrum, produced in breast milk during the first days after delivery, has long been thought to confer additional protection against infantile diarrhea, because of the immune and nonimmune properties of colostrum.[3,4] However, a preventive effect of initiation of breastfeeding shortly after birth, when colostrum is produced, on the occurrence of diarrhea during infancy has never been demonstrated convincingly.

A prospective birth cohort study of dietary practices and diarrheal illness in rural Egypt gave us the opportunity to evaluate the association between early initiation of breastfeeding and the rate of diarrhea during infancy. Data from this cohort demonstrate that early initiation of breastfeeding was associated with a notably lower rate of diarrhea during the first 6 months of life and that this protective association was independent of the pattern of dietary practices during infancy.

METHODS

Protocol Approvals

The protocol for this study was approved by institutional review boards of the US Naval Medical Research Unit-3, the US National Institute of Child Health and Human Development, and the World Health Organization.

Setting

The cohort was assembled in two villages located in the Abu Homos district of Beheira Governorate, ~40 km from Alexandria. Abu Homos is a rural area, and most adults there are engaged in agricultural occupations.

Assembly of the Cohort

In January 1995, a house-by-house census of the two study villages was undertaken. At this time, households were characterized according to selected sociodemographic characteristics as well as to various aspects of household hygiene, including water use and facilities for defecation. Neonates ≤28 days were enrolled for the study beginning in February 1995, after ascertaining that they had neither major congenital abnormalities nor current illnesses serious enough to require hospitalization, and after obtaining written informed consent from their parents (for parents who were illiterate, the form was read to the parent in the presence of a witness; if the parent consented to the protocol, this consent was documented by a fingerprint). Because the focus of the present analysis was to assess the impact of early initiation of breastfeeding, we included only those neonates who had ever been breastfed. Moreover, because patterns of breastfeeding and infant morbidity may be substantially different for twin births, we included only singleton births in our analysis.

Enrollment of newborns ended in September 1997. A total of 211 neonates were identified, of whom 204 were singleton births. Only 3 (1%) of these neonates had never breastfed. Among the remaining 201 neonates, all of whom met the eligibility criteria cited above, the 3 for whom the day of onset of breastfeeding was unknown were excluded, leaving a total of 198 initially breastfed

infants for analysis. The median age at enrollment for this analyzed cohort was 11 days (interquartile range, 7–16 days).

Surveillance of the Cohort

After enrollment each infant was visited at home twice weekly. At each visit the mother of the infant was interviewed about the passage of loose or liquid stools by the infant on each day since the last scheduled visit. Diet was monitored by queries about whether the infant still received breast milk, as well as about what additional foods and liquids had been introduced into the infant's diet since the last visit. These home visits also enabled us to monitor all deaths and outmigrations occurring in the study cohort. Of the scheduled twice-weekly visits, 95% were completed successfully.

Surveillance continued through February 1998. Before inspection of the data, we decided to limit the primary analysis to the first 6 months of life, because we considered it unlikely that early initiation of breastfeeding per se would exert a preventive effect on diarrhea beyond this age. Of the cohort, 190 (96%) were followed until 6 months of age. For 4 infants, the surveillance phase of the study stopped before they had reached 6 months of age. One infant died, whereas an additional 3 infants were lost to follow-up.

Study Definitions

We established definitions of key variables before analyzing the data. A "diarrheal day" was defined as 1) passage of three or more loose or liquid stools in any 24-hour period (for breastfed infants, this also required a statement by the mother that the stools had become more frequent or less formed than usual for the infant); or 2) passage of at least one loose or liquid stool with visible blood in a 24-hour period. An episode of diarrhea was bounded by three or more consecutive nondiarrheal days.

A child was considered to be breastfed if breast milk constituted any portion of the child's diet. Exclusive breastfeeding denoted diets consisting of breast milk only, without other solids or liquids. All other breastfed infants were considered "partially breastfed." "Early initiation" of breastfeeding referred to breastfeeding that started on the day of birth or during the next 2 days of life, because breast milk contains an appreciable amount of colostrum only during this interval.[5,6] Late initiation indicated breastfeeding that began after the third day of life.

Analytic Strategies

In simple two-group comparisons, the Student t test (or the Mann-Whitney U test when parametric assumptions were not fulfilled) was used for dimensional variables, and the χ^2 test (or Fisher's exact test for dichotomous variables when data were sparse) was used for categorical variables. To compare the duration of breastfeeding in different groups, we constructed Kaplan-Meier survival curves and compared these curves statistically with the log-rank test.

The incidence rate of diarrhea for an infant was calculated by dividing the number of episodes of diarrhea by the number of person-days at risk. The latter was computed as the potential number of days of follow-up, minus the number of days with missing information and the number of days included in the diarrheal episodes after the first day of each episode. We excluded days after the first day of each episode from the denominators because the child was not at risk for a new episode during these days.

To compare incidence rates of diarrhea in different groups of infants, we used multiple logistic regression models. In these models, we took each day at risk for diarrhea (eg, the days included in the denominators for calculation of incidence rates) as the unit of analysis. With these units, we fitted models in which the occurrence or nonoccurrence of a first day of a new episode of diarrhea was the dichotomous dependent variable, and timing of breastfeeding initiation, together with relevant covariates were fitted as independent variables. Because we classified each day of follow-up in this manner, it was possible to specify time-varying independent variables, such as current diet, in these models. Moreover, because different days of follow-up for each child were not statistically independent entities, it was necessary to adjust for the intercorrelations of repeated observations on different days for individuals with generalized estimating equations (GEE)[7] (SAS version 6.12, PROC GENMOD, SAS Institute, Inc. SAS/STAT

software, Changes and Enhancements through Release 6.12, SAS Institute, Inc, Cary, NC). Coefficients of independent variables in these models were exponentiated to estimate odds ratios (ORs) values for the associations between independent variables and the occurrence of diarrhea on each day, and SE values of these coefficients were used to calculate the 95% CI for each OR. Because the risk of a new diarrheal episode on any particular day was rare (2% per day of follow-up), these OR values are interpretable as ratios of relative rates (RR), and are referred to as such in the text.[8] We present data for GEE models fitted with exchangeable variance–covariance matrices for the intercorrelation of daily observations in individuals. However, refitting the models with both first-order autoregressive and unstructured matrices gave virtually identical estimates, indicating that the findings were robust with respect to the assumed pattern of intercorrelation of observations. All statistical tests were interpreted in a two-tailed manner to estimate P values and to compute confidence intervals; P values <.05 were considered significant.

RESULTS

Prevalence and Correlates of Early Initiation

Of the 198 ever-breastfed infants in the cohort, 151 (76%) started to breastfeed during the first 3 days of life. Table 1 compares early- versus late-initiated children for several features. Although there were no significant differences, a higher percentage of newborns started early were born in a hospital or clinic, as opposed to at home; had mothers with at least some formal education; lived in a home with luxury items such as a television, radio, or washing machine; and lived in a home with a sanitary latrine.

Relationship Between Early Initiation and Later Breastfeeding Practices

The life-table probability of continuing breastfeeding for at least 6 months was 94% for the entire cohort and slightly higher (95%) for infants initiated early than for infants initiated late (89%; $P = .10$, log-rank test). Correspondingly, the life-table probability of being breastfed exclusively for at least 6 months was 37% for the entire cohort, and also was somewhat higher for those initiated early (40%) than for those initiated late (25%; $P = .05$, log-rank test).

Relationship Between Early Initiation, Later Breastfeeding Practices, and the Rate of Diarrhea

A total of 562 episodes of diarrhea were detected in the cohort, corresponding to an incidence rate of seven episodes per child-year of follow-up (Table 2). Overall, infants whose breastfeeding had been initiated early had a lower rate (episodes per child-year) than did those initiated late (6.4 vs 9.0). Rates also varied inversely with the importance of breast milk in the diet at follow-up (exclusively breastfed, 6.5; partially breastfed, 7.9; not breastfed, 12.6). Within each category of diet at follow-up, rates of diarrhea for infants initiated early were lower than were rates for those initiated late. These gradients between early and late initiators were seen for the entire cohort and for the subcohorts followed from birth to 3 months and from 3 to 6 months.

Table 3 presents a multivariate analysis of the simultaneous relationship between timing of initiation of breastfeeding, diet at follow-up, and the rate of diarrhea. These models also controlled for age at follow-up as well as for several potentially confounding factors that might be associated either with

TABLE 1. Comparative Features of Study Infants, by Time of Initiation of Breastfeeding

Feature	Initiation of Breastfeeding*	
	Early (n = 151)	Late (n = 47)
Infant		
Male	70 (46%)	25 (53%)
Born in hospital or clinic	30 (20%)	6 (13%)
Mother		
Educated†	15 (10%)	1 (2%)
Age (y)‡	24.4 ± 6.3§	24.4 ± 5.5
Had previous live birth	125 (83%)	38 (81%)
Had previous infant death‖	23 (18%)	5 (13%)
Household		
No. of residents¶	12.7 ± 5.6	12.8 ± 6.0
Residents per room#	5.1 ± 2.7	4.9 ± 2.2
Electricity provided	130 (86%)	42 (89%)
Sanitary latrine**	81 (54%)	18 (38%)
Municipal water supply	138 (91%)	42 (89%)
Ownership of		
Television	70 (46%)	16 (34%)
Radio	83 (55%)	24 (51%)
Washing machine	35 (23%)	6 (13%)

* Early initiation is defined as initiation in the first 3 days of life; late initiation is defined as initiation after the first 3 days of life.
† Education is defined as receipt of any formal schooling.
‡ Age at the time of enrollment of the infant.
§ Mean ± SD.
‖ Denominators for percentages were mothers with previous live births.
¶ The large number of residents reflected the fact that most households consisted of several related families.
# Calculated as the number of residents divided by the number of rooms used for sleeping.
** Defined as a toilet or latrine connected to municipal sewage system or to a sealed pit.

TABLE 2. Rate of Diarrhea by Time of Initiation of Breastfeeding and by Age and Diet at Follow-up in the Study Cohort

Age and Diet at Follow-up	Initiation of Breastfeeding*		
	Early	Late	Early or Late
≤3 m of age			
Exclusively breastfed	5.24† (8,910; 149)	7.16 (2,295; 44)	5.64 (11,205; 193)
Partially breastfed	6.31 (1,505; 86)	8.61 (763; 34)	7.08 (2,268; 120)
Not breastfed	0 (35; 5)	14.31 (51; 4)	8.49 (86; 9)
All diets	5.38 (10,450; 151)	7.63 (3,109; 47)	5.90 (13,559; 198)
>3 m of age			
Exclusively breastfed	6.98 (6,849; 140)	9.47 (1,889; 42)	7.52 (8,738; 182)
Partially breastfed	7.92 (4,886; 140)	8.94 (1,348; 43)	8.14 (6,234; 183)
Not breastfed	7.18 (305; 11)	18.20 (361; 8)	13.15 (666; 19)
All diets	7.37 (12,040; 149)	10.14 (3,598; 47)	8.01 (15,638; 196)
0–6 m of age			
Exclusively breastfed	6.00 (15,759; 149)	8.20 (4,184; 44)	6.46 (19,943; 193)
Partially breastfed	7.54 (6,391; 143)	8.82 (2,111; 47)	7.86 (8,502; 190)
Not breastfed	6.44 (340; 13)	17.72 (412; 9)	12.62 (752; 22)
All diets	6.44 (22,490; 151)	8.98 (6,707; 47)	7.03 (29,197; 198)

* Early initiation is defined as initiation in the first 3 days of life; late initiation is defined as initiation after the first 3 days of life.
† Diarrheal episodes per person-year of follow-up (person-days of actual follow-up in the cited category; number of infants contributing follow-up to the cited category). Note that a given infant could contribute follow-up to more than one cited category within an age interval if the infant's diet changed during the age interval.

the timing of initiation or with the rate of diarrhea. Timing of initiation of breastfeeding and diet at follow-up each were independently predictive of the rate of diarrhea during the first 6 months of life. Infants initiated on breastfeeding early had a 26% lower rate of diarrhea ($P < .05$; 95% CI: 2%,44%) than did those who initiated late. Conversely, relative to infants who were not breastfed, infants who were breastfed exclusively had a 33% ($P < .05$; 95% CI: 3%,53%) lower rate of diarrhea, and infants who were partially breastfed had a 28% (95% CI: −1%,48%) lower rate of diarrhea. When analyzed by individual day of initiation, there was a trend for earlier initiation to be associated with a greater pro-

tective association with diarrhea, but this trend did not reach statistical significance. There was no statistical interaction between timing of initiation, on the one hand, and exclusivity of later breastfeeding, on the other hand, in influencing the rate of diarrhea.

Although our primary hypothesis concerned only the rate of diarrhea during the first 6 months of life, the protective associations observed during early infancy raised the question of whether the protection associated with early initiation was sustained beyond 6 months of age. Therefore, we analyzed the occurrence of diarrhea during the second half of infancy in the subset of infants ($n = 163$) whose date of birth allowed for at least 1 year of follow-up. The

TABLE 3. Initiation of Breastfeeding, Diet at Follow-up, and the Rate Ratio of Diarrhea in 198 Infants Followed From Birth to 6 Months

Variable	Adjusted Rate Ratio of Diarrhea‡	95% CI
Initiation of breastfeeding		
Early	0.74*	0.56, 0.98
Late	1.00†	—
Diet at follow-up		
Exclusively breastfed	0.67*	0.47–0.97
Partially breastfed	0.72	0.52–1.01
Not breastfed	1.00†	—

* $P < .05$ (two-tailed) for comparison with reference category.
† Reference category.
‡ Adjusted rate ratios were derived from multiple logistic regression models, estimated with GEEs and simultaneously fitting time of initiation of breastfeeding (early vs late); current diet (exclusively breastfed, partially breastfed, nonbreastfed), as well as the following additional covariates as independent variables: gender; birth site (hospital or clinic vs home); age at follow-up (in days); maternal education (none vs some); season at follow-up (May–October, warm vs November–April, cold); presence of municipal water supply to house; presence of a sanitary latrine in house; ownership of a television; and ownership of a washing machine. Loss of previous infant was not included in the model, because inclusion of this variable did not alter estimated rate ratios for early initiation and for later dietary practices and because inclusion of this variable excluded the 18% of the cohort whose mothers had not had a previous live birth.

incidence of diarrhea between 6 months and 1 year of age in this group was 7.9 episodes per child-year. After adjustment in multivariate models for the factors cited in Table 3, the rate of diarrhea in infants initiated early was virtually identical to those initiated late (RR = 0.95; 95% CI: 0.70,1.31).

DISCUSSION

Our data indicate that early initiation of breastfeeding was associated with a 26% lower rate of diarrhea during the first 6 months of life. Interestingly, this protective relationship was of the same order of magnitude as the protective association between later breastfeeding and the rate of diarrhea. Importantly, the protective relationship between early initiation of breastfeeding and diarrhea was independent of postinitiation breastfeeding practices, because both early initiation of breastfeeding and later breastfeeding practices exhibited independent protective associations with diarrhea in our multivariate models. The protection associated with early initiation was not sustained beyond 6 months of age. However, a protective effect limited to the first 6 months of life still was clinically important in our study population, because the incidence of diarrhea during this age-interval was high: seven episodes per child-year of follow-up.

Potential Limitations

Before discussing our findings, it is important to address several possible limitations of our analysis. First, mothers' decisions about when to initiate breastfeeding are not random, and it is possible that factors influencing choices about when to initiate breastfeeding also affected infant diarrheal rates. However, confounding of the association between early initiation and the rate of diarrhea by such fac-

tors should have been minimized by simultaneous control for a large number of potential confounding variables in the multivariate models used in our analyses. Moreover, our observation of an absent protective association between early initiation of breastfeeding and the rate of diarrhea during the second 6 months of life, which seems biologically plausible, makes confounding bias an extremely unlikely explanation for our observation of a protective association during the first 6 months of life.

Second, we analyzed only the time of initiation of breastfeeding and did not have detailed data about the amount of colostrum or about other dietary items that were actually fed to each infant. Moreover, we did not record whether mothers who initiated breastfeeding late actually expressed their colostrum during the first 3 days after birth of their newborns. Thus, any conclusions about the role of colostrum in explaining the relationship between early initiation of breastfeeding and the rate of diarrhea must be considered tentative.

Third, it might be questioned whether our definition of diarrhea captured pathologic events suitably, because it is well known that breastfed infants commonly have loose stools as a normal event. We believe that our definition was appropriate, however, because it demanded that mothers note an increase in stool frequency or a decrease in stool consistency if the only manifestation of diarrhea was nonbloody loose stools. Moreover, if the loose stooling captured by our definition was caused by breastfeeding, breastfeeding should have exhibited a direct relationship with the rate of diarrhea, not the inverse relationship evident in our data (Tables 2, 3). In addition, when we limited our multivariate analyses to diarrheal episodes associated with objective dehydration, the relationship between early initiation and diarrhea during the first 6 months of life (RR = .77) was nearly identical to the association found in our analysis of all diarrheal episodes (RR =.74; Table 3).

Relation to Other Studies

It was remarkable that 24% of breastfed newborns in our study were not put to the breast until after the third day of life, possibly because of beliefs among mothers that colostrum may be useless or even harmful to their newborns.[9] Interestingly, an earlier study of rural Egyptian newborns[6] found that 31% of mothers who breastfed initiated suckling after the first 3 days of life—a figure very similar to the findings of our study. As with our study, the earlier study found late initiation of breastfeeding to be more common among mothers who had had less formal education.

Two studies have found early initiation of breastfeeding to be suggestively[10] or significantly[11] associated with a lower rate of diarrhea during infancy. However, both studies were limited by important methodologic problems. First, neither study controlled for potentially confounding sociodemographic variables. Adjustment for such variables is needed because higher socioeconomic status is known to be associated both with an earlier onset of breastfeeding[12] and with lower rates of diarrhea dur-

ing infancy in childhood.[13] Second, neither study evaluated whether the relationship between early initiation of breastfeeding and the rate of diarrhea could be explained by the possibilities that mothers who initiated breastfeeding early may be more likely to breastfeed their infants until older ages or may have a greater tendency to breastfeed exclusively. Analytic control for later breastfeeding practices during infancy is critical, because breastfeeding of infants is documented to be highly protective against diarrhea.[1,2] A major strength of our analysis was the demonstration that the protective relationship between early initiation of breastfeeding and infantile diarrhea, evident in simple analyses (Table 2), persisted after analytic control for potentially confounding variables and for breastfeeding practices during the period of follow-up in infancy (Table 3).

Biological Implications

Early initiation of breastfeeding could affect the later incidence of diarrhea by at least two mechanisms. First, it might be argued that the lower rate of diarrhea in early initiators occurred because mothers who suckle their offspring shortly after birth have a greater chance of successfully establishing and sustaining breastfeeding throughout infancy[14,15] and because breastfeeding during infancy is related protectively to diarrhea. Our data confirm that early initiation was associated with somewhat more successful establishment of breastfeeding during infancy. However, this relationship fails to explain the protective relationship between early initiation and the rate of diarrhea, because early initiation of breastfeeding and later breastfeeding practices at follow-up each were independently associated with lower rates of diarrhea in our multivariate models (Table 3).

A more likely explanation comes from consideration of the colostrum that is contained in breast milk during the first days of life. Human colostrum, expressed in early breast milk, is rich in a variety of immune and nonimmune components that may be capable of protecting against infection by enteric pathogens.[5] Moreover, colostrum is known to contain several epithelial growth factors that conceivably might accelerate intestinal maturation and resistance to infection as well as epithelial recovery from infection.[16]

That the apparent protective effect of early initiation of breastfeeding lasted throughout the first 6 months of life is remarkable. This unexpectedly long duration of protection might be explained by an effect of early initiation in protecting against diarrhea occurring shortly after birth, because it is well documented that diarrheal infections themselves are risk factors for repeated diarrheal infections during infancy and childhood.[17]

Implications for Policy and Research

Our findings document that late initiation of suckling occurred in an appreciable minority of breastfed infants in our field area and that late initiation left an enduring legacy of an elevated risk of diarrhea during infancy, even among infants who continued to be breastfed. These observations underscore the need to better understand the maternal beliefs about breastfeeding practices in the days immediately after birth and to devise interventions specifically targeted to remedy the problem of late initiation. Promotion of breastfeeding should be supplemented by promotion of initiation of breastfeeding at birth.

REFERENCES

1. Feachem R, Koblinsky M. Interventions for the control of diarrhoeal diseases among young children: promotion of breast-feeding. *Bull WHO.* 1984;62:271–291
2. Jason J, Nieburg P, Marks J. Mortality and infectious disease associated with infant feeding practices in developing countries. *Pediatrics.* 1984; 74:702–727
3. Ogra P, Dayton D. *Immunology of Breast Milk.* New York, NY: Raven Press; 1979
4. Goldman A, Goldblum R, Hanson L. Anti-inflammatory systems in human milk. *Adv Exp Med Biol.* 1990;262:69–76
5. Ogra P, Rassin R. Human breast milk. In: Remington J, Klein J, eds. *Infectious Diseases of the Fetus and Newborn Infant.* 4th ed. Philadelphia, PA: WB Saunders Co; 1997:111
6. Hakim I, El-Ashmawy I. Breast-feeding patterns in a rural village in Giza, Egypt. *Am J Public Health.* 1992;82:731–732
7. Diggle P, Liang K-Y, Zeger S. *Analysis of Longitudinal Data.* Oxford, UK: Oxford University Press; 1994
8. Vine M, Schoenbach V, Hulka B, Koch G, Samsa G. Atypical metaplasia and incidence of bronchogenic carcinoma. *Am J Epidemiol.* 1990;131: 781–793
9. Morse J, Jehle C, Gamble D. Initiating breast-feeding: a world survey of the timing of postpartum breast-feeding. *Int J Nurs Stud.* 1990;3:303–312
10. Gunnlaugsson G, da Silva M, Smedman L. Does age at the start of breast-feeding influence infantile diarrhoea morbidity? A case–control study in periurban Guinea-Bissau. *Acta Paediatr.* 1995;84:398–401
11. Badruddin S, Islam A, Hendricks K, et al. Dietary risk factors associated with acute and persistent diarrhea in children in Karachi, Pakistan. *Am J Clin Nutr.* 1991;54:745–749
12. Gunnlaugsson G, Da Silva M, Smedman L. Determinants of delayed initiation of breast-feeding: a community and hospital study from Guinea-Bissau. *Int J Epidemiol.* 1992;21:935–940
13. Stanton B, Clemens J. Socioeconomic variables and rates of diarrhoeal episodes in Bangladesh. *Trans Roy Soc Trop Med Hyg.* 1987;81:270–273
14. Taylor P, Maloni J, Brown D. Early suckling and prolonged breast-feeding. *Am J Dis Child.* 1986;140:151–154
15. Salariya E, Easton P, Cater J. Duration of breast-feeding after early initiation and frequent feeding. *Lancet.* 1978;11:1141
16. Carver J, Barness L. Trophic factors for the gastrointestinal tract. *Clin Perinat.* 1996;23:265–285
17. Bhandari N, Bhan MK, Sazawal S, Clemens J, Bhutnagar S, Khoshoo V. Association of antecedent malnutrition with persistent diarrhea: a case–control study. *Br Med J.* 1989;298:1284–1286

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/104/1/e3
References	This article cites 14 articles, 3 of which you can access for free at: http://pediatrics.aappublications.org/content/104/1/e3#BIBL
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://www.aappublications.org/site/misc/reprints.xhtml

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®

PEDIATRICS

Early Initiation of Breastfeeding and the Risk of Infant Diarrhea in Rural Egypt

John Clemens, Remon Abu Elyazeed, Malla Rao, MEngg, MPH, Stephen Savarino, Badria Z. Morsy, Yongdai Kim, Thomas Wierzba, Abdollah Naficy and Y. Jack Lee

The online version of this article, along with updated information and services, is located on the World Wide Web at:

http://pediatrics.aappublications.org/content/104/1/e3

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®