

Breast-feeding and Vitamin D Supplementation Rates in the Ochsner Health System

Tulasi Ponnappakkam, PhD,* Anisha Ravichandran,† Elease Bradford,* Gregory Tobin,‡
Robert Gensure, MD, PhD*

*Pediatric Endocrinology Research Laboratory, Ochsner Clinic Foundation, New Orleans, LA

†Louisiana School for Math, Science, and the Arts, Natchitoches, LA

‡Jesuit High School, New Orleans, LA

ABSTRACT

Breast-feeding imparts many benefits to both mothers and infants. Because of these numerous recognized benefits, there has been an effort to increase breast-feeding rates nationwide; increasing breast-feeding rates was one of the goals of the U.S. Department of Health and Human Services' Healthy People 2010 initiative. This study examined the breast-feeding rate at the Ochsner Clinic Foundation by conducting a retrospective chart review of patients aged 0–12 months who visited any branch of the Ochsner hospital system. Our results indicate that the rate of initiation of breast-feeding for children followed at the Ochsner Clinic Foundation is 66.3%. However, as breast-feeding rates rise, there is concern that there may be a resurgence of rickets, a disease caused by the deficiency of vitamin D. Currently the American Academy of Pediatrics recommends that exclusively breast-fed infants receive vitamin D supplementation starting within the first 2 months of life. We have therefore initiated a clinical trial to determine whether vitamin D supplementation is required to prevent rickets in breast-fed children. In the course of conducting this study, we have gathered additional data regarding the patterns of breast-feeding and of vitamin D supplementation for babies born at Ochsner.

INTRODUCTION

Breast-feeding imparts many benefits to both mothers and infants. For infants, breast-feeding is associated with a decreased risk for many early-life

diseases and conditions, including otitis media, respiratory tract infections, atopic dermatitis, gastroenteritis, type 2 diabetes, sudden infant death syndrome, and obesity. For mothers, benefits include improved bonding with the infant¹ and a decreased risk of type 2 diabetes, ovarian cancer, and breast cancer.²

Because of these numerous recognized benefits, there has been an effort to increase breast-feeding rates nationwide; increasing breast-feeding rates was one of the goals of the U.S. Department of Health and Human Services' Healthy People 2010 initiative.³ Reports indicate that whereas more than 67% of mothers in the United States breast-fed in the early 1900s,⁴ breast-feeding rates reached their lowest levels in 1972, when only 22% of women breast-fed.⁵ By 1975, however, breast-feeding rates began to rise, increasing from 33.4% in 1975 to 59.7% in 1984.⁶ A survey conducted by Ross Laboratories demonstrates increases in both the initiation of breast-feeding (from 52.2% to 59.7%) and of continued breast-feeding at 6 months of age (from 18.1% to 21.6%) between 1989 and 1995.⁷ In 2001, breast-feeding rates, including the initiation of breast-feeding and continued breast-feeding to 6 months of age, reached the highest levels recorded to date in the United States (69.5% and 32.5%, respectively).⁸ A survey report from 2006 suggests that breast-feeding rates have continued to increase, with approximately 36% of children being breast-fed for the first 6 months of life.⁹ The Centers for Disease Control and Prevention has recently released data on breast-feeding rates for 2005 for the entire United States, broken down by state.¹⁰ In the state of Louisiana, the rates are as follows:

- Ever breast-fed 50.4% ± 4.0%.
- Breast-feeding at 6 months 19.9% ± 2.9%.
- Breast-feeding at 12 months 8.2% ± 1.8%.
- Exclusive breast-feeding at 3 months 22.6% ± 3.2%.
- Exclusive breast-feeding at 6 months 6.4% ± 1.6%.

Unfortunately, there are no specific data existing regarding breast-feeding rates from the greater New

Address correspondence to:
Tulasi Ponnappakkam, PhD
Pediatric Endocrinology Research Laboratory
Ochsner Clinic Foundation
1514 Jefferson Hwy
New Orleans, LA 70121
Tel: (504) 842-4341
Fax: (504) 842-5947
Email: tponnappakkam@ochsner.org

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Orleans area or from our own hospital. We therefore studied the breast-feeding rate in the Ochsner Health System by retrospective chart review.

One of the concerns regarding rising breast-feeding rates in the United States is whether breast milk has enough vitamin D in it. Vitamin D is a hormone that regulates serum calcium and phosphate, compounds that are important in bone mineralization, muscle contraction, nerve conduction, and general cellular function. Vitamin D can be synthesized in the skin after exposure to sunlight or can be obtained from the diet. Vitamin D deficiency in infants causes rickets, a condition in which there is poor mineralization of the bone because of decreased intestinal absorption of calcium and phosphate, and thus deficient substrate for bone mineralization. The softening of the bones in rickets leads to bone deformities, including the classic bowing of the lower extremities. The growth plates are widened, leading to bulging at the wrists and swelling of the costal-chondral junctions in the ribs (rachitic rosary). The skull bones can fuse prematurely, leading to a deformity of the head (craniotabes), which can in turn affect brain development. Biochemical abnormalities include high levels of alkaline phosphatase, low 25-hydroxyvitamin D levels with paradoxically normal 1,25-OHD levels, secondary hyperparathyroidism, low serum phosphorus, and hypocalcemia (which can cause seizures). Findings on x-ray include splaying of the growth plates in the wrist and knees. The strategy to prevent rickets in the United States has been to supplement infant formula with vitamin D. However, as breast-feeding rates rise, there is concern that there may be a resurgence of this disease. Currently the American Academy of Pediatrics (AAP) recommends that exclusively breast-fed infants receive vitamin D supplementation starting within the first 2 months of life.¹¹ We have therefore initiated a clinical trial to determine whether vitamin D supplementation is required to prevent rickets in breast-fed children. In the course of conducting this study, we have gathered additional data regarding the patterns of breast-feeding and of vitamin D supplementation for babies born at Ochsner hospitals.

MATERIAL AND METHODS

For study of breast-feeding rates at Ochsner, Institutional Review Board (IRB) approval (No: 2007.088 B) was obtained to conduct a retrospective chart review of any pediatric patients aged 0–12 months who visited any branch of Ochsner. The list was obtained from the Information Technology department. Only patients for whom the following data could be verified were selected: maternal age, sex of the infant, and feeding history for the first year of life.

Clinical encounter notes of 104 patients who fulfilled our research plan criteria were examined to determine breast-feeding rates in the Ochsner system. Vitamin D supplementation in breast-fed infants was also examined to review Ochsner's standard pediatric practices. The information from the clinic notes was tabulated, documented in a Microsoft Excel spreadsheet, and used to calculate the breast-feeding rate for the sample at birth and at 2, 4, 6, 9, and 12 months of age.

For our ongoing vitamin D supplementation study, approval from the Ochsner IRB was obtained (2006-186A). Study subjects are being recruited from the normal newborn nursery at Ochsner. Parents who indicated that they intended to breast-feed (>50% of total intake) for at least the first 3 months of life are eligible to participate. Prior to randomization, the study population is stratified based on the presence or absence of additional risk factors for rickets (dark skin color or full-body clothing/draping) to reduce the influence of this potentially confounding factor on the overall results.

The study participants are randomized into one of the three study groups:

Group 1: No supplementation for the first 6 months of age.

Group 2: Supplementation with 200 IU vitamin D per day starting at 2 months of age.

Group 3: Supplementation with 200 IU vitamin D per day starting at birth.

Study participants are evaluated at birth and at 2, 4, and 6 months of age. Height and weight are documented, and data are collected from the parents through questionnaires at the 2-, 4-, and 6-month visits regarding nutrition, use of sunscreens, and daily exposure to sunlight. Blood samples are obtained for the measurement of calcium, phosphorus, parathyroid hormone, 25-hydroxyvitamin D, alkaline phosphatase, and osteocalcin (cord blood is used at birth). These tests are performed in our laboratory using commercially available kits. In addition, hand x-rays are obtained to evaluate for rachitic changes if the alkaline phosphates are greater than twice the normal value. Participation in the study is discontinued for any individual meeting the following criteria: >50% supplementation with formula feeding in the first 3 months of life, radiographic evidence of rickets, hypocalcemic seizures, hypocalcemia, hypercalcemia, or hypervitaminosis D (elevated 25-hydroxyvitamin D levels).

Presented herein are summary data from our recruitment efforts so far—the number of patients with whom we discussed the study, the number who agreed to participate, and the number who dropped

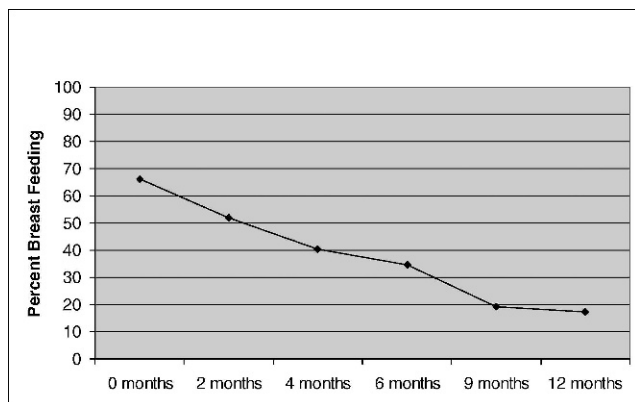


Figure 1. Breast-feeding rates at Ochsner.

out prematurely, including the reasons for dropping out. Of note, discontinuation of breast-feeding is a major reason for infants to drop out of the study, and the data we have accumulated to date in a prospective fashion serve as a supplement to the data obtained in our retrospective chart review.

RESULTS

Our results indicate that the rate of initiation of breast-feeding for children followed at the Ochsner Clinic Foundation is 66.3% (Figure 1, Table 1). By 6 months of age, the rates had declined to 34.6%, and by 9 months the rates had declined to 19.2%. The rate of decline in breast-feeding appeared to be essentially linear over this 9-month period ($R^2 = 0.98, P < 0.01$). There was little change in the breast-feeding rates observed after 9 months (17.3% at 12 months of age).

Importantly, it was found that maternal age influences breast-feeding rates. In the <26 age group, the initiation rate is low (43%). In the other age groups, the initiation rate is higher (68%–80%, Figure 2). Drop-out rates over the 12-month period are similar across all age groups, such that the initiation rate effectively predicts the subsequent breast-feeding rates at the later time points. The initiation of breast-feeding appeared to be higher for male infants (68%) than for female infants (57%) (Figure 3). Only one patient in the sample received vitamin D supplementa-

Table 1. Breast-feeding Rates in the Ochsner Health System

Month	Breast-feeding Rate (%)
0	66.34
2	51.92
4	40.38
6	34.61
9	19.23
12	17.30

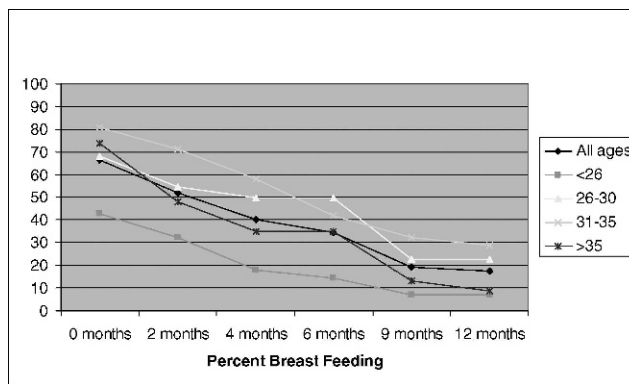


Figure 2. Influence of maternal age on breast-feeding rates.

tion (1.4%), and there was no documentation of discussion of vitamin D supplementation in the other 68 patients who were breast-feeding at birth. No cases of rickets were noted among any of the study patients.

As part of an ongoing effort to recruit patients for our vitamin D supplementation prospective trial, we had an opportunity to interview new mothers at the Mother/Baby unit at Ochsner’s main campus. Of the 757 new mothers, between the months of July and December 2007, 408 mothers (53%) were breast-feeding their infants. We have asked 94% of the breast-feeding mothers to enroll their infants in our study after explaining the benefits of breast-feeding and vitamin D supplementation, but only 5% agreed to participate in our study. The major reasons given for not wanting to participate in the study are as follows: did not want to participate in a research study (26.5%), did not want to give daily medication (10.3%), do not plan to breast-feed at least 50% of the time for 3 months (8.6%), and did not want to subject the baby to blood tests (5.9%). Retention among the recruited patients is also very low (10%). The majority of these patients (66%) drop out between the 0–2 time month period of our 6 month study (Table 2). The reasons given by the mothers for withdrawing their babies from the study differ from those documented in the pediatric notes—the notes indicate that the overwhelming majority are withdrawn because the babies are no longer being breast-fed. Specific reasons for the cessation of breast-feeding included the end of maternity leave and the inability of the baby to breast-feed properly.

DISCUSSION

The breast-feeding rates of children followed at Ochsner (66%) is higher than the overall breast-feeding rate in the state of Louisiana (50.4%) and closer to the national average (64%) (Table 3). However, the breast-feeding rates of children born

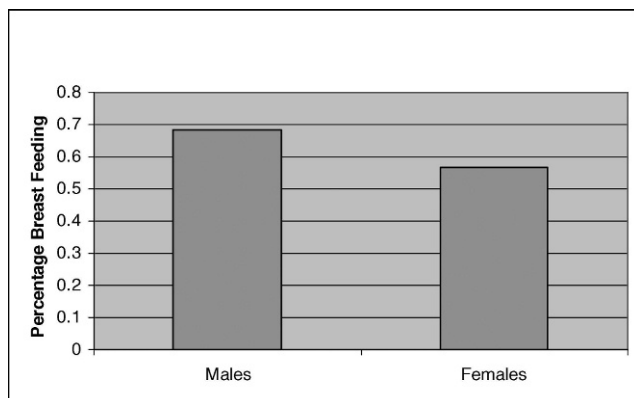


Figure 3. Breast-feeding rates for male vs. female infants.

at Ochsner were not as high, only 53%. All of these rates are below the 75% breast-feeding rate goal of the Healthy People 2010 initiative.¹² The reasons for the difference in breast-feeding rates between children born at Ochsner and children followed at Ochsner are not clear but may reflect the diversion of deliveries from the Charity Hospital system in New Orleans following Hurricane Katrina; these babies are less likely to be followed by Ochsner pediatricians because of geographic constraints.

Nearly half of the babies followed at Ochsner who were breast-fed at birth are no longer being breast-fed at 6 months of age, and more than 80% are no longer breast-fed at 12 months of age. The data obtained while recruiting for our ongoing clinical trial of vitamin D supplementation in breast-fed infants also indicate that the majority of infants who are breast-fed at birth are no longer being breast-fed at 6 months of age. There are many possible reasons for this sharp decline in breast-feeding rates with age. A study conducted in Perth, Western Australia, found that the most common reason for discontinuing breast-feeding was that the baby was unsettled, a behavior often interpreted by mothers as indicating an insufficient milk supply. Proper advice and management are required to ensure that breast-feeding is

continued.¹³ Other reasons for low initiation and/or continuation are that breast-feeding is cumbersome and impractical. Furthermore, time constraints placed by short maternity leaves, sleep deprivation, and failure to thrive by the infant can contribute to the cessation of breast-feeding.

To overcome the obstacles to initiation and continuation of breast-feeding, we should consider implementing an intervention similar to the one conducted in Grenoble, France. In this study, the mothers were divided into two groups. Support for breast-feeding in the intervention group included verbal encouragement provided by the maternity ward staff members, a general health assessment, an evaluation for evidence of successful breast-feeding behavior, access to a peer support group, 10 weeks of paid maternity leave, and mandatory outpatient visits at 1, 2, 3, 4, 5, and 6 months of infant age. Furthermore, the intervention group was invited to attend an individual outpatient seminar at the office of one of the 17 primary care physicians (pediatricians or family physicians) within 2 weeks of birth. The participating physicians received a 5-hour training program on breast-feeding, presented in two parts in 1 month. Mothers in the intervention group were more likely to report exclusive breast-feeding at 4 weeks and longer breast-feeding duration. They were less likely to report any breast-feeding difficulties. The authors concluded that breast-feeding support through early, routine, preventive visits in the offices of trained physicians is efficacious and that a short training program for practicing physicians may contribute to improving breast-feeding outcomes.¹⁴ Similarly, another study suggests that extensive education regarding the benefits of breast-feeding be provided for parents by physicians, nurses, and the media.¹⁵

Vitamin D supplementation was documented for only one patient out of 69 breast-fed infants whose charts were reviewed, and there was no documentation of any discussion of vitamin D supplementation in the other 68 infant's charts. It is not clear if the

Table 2. Recruitment Summary of Vitamin Supplementation Trial: Mother/Baby Unit

Month (April 07–June 07)	Born	Breast-fed	Asked	Enrolled 11	Dropped 7	Continued 4	Completed 4
July 07	122	56	49	4	4	0	0
Aug 07	154	78	76	7	6	1	0
Sep 07	132	69	67	1	1	0	0
Oct 07	126	83	79	11	7	4	0
Nov 07	115	58	47	3	0	3	0
Dec 07	108	64	53	1	0	1	0
Total	757	408	371	38	25	13	4

Table 3. Comparison of Breast-feeding Rates

	Nationwide 1998 Baseline	Nationwide 2010 Target	Ochsner Health System	Louisiana State	Healthy People 2010 Target
In early postpartum	64%	75%	66%	50.4%	75%
At 6 months	29%	50%	35%	19.9%	50%
At 1 year	16%	25%	17.3%	8.2%	25%

documentation is lacking or if supplementation is not being advised in clinical practice in the Ochsner Health System. There were no cases of rickets in those 68 patients, nor have there been any cases of rickets reported in infants <12 months of age in the Ochsner Health System over the last 3 years. This suggests that the current AAP recommendations for vitamin D supplementation may not be necessary in southern Louisiana. Our ongoing controlled study of vitamin D supplementation in breast-fed infants should be able to help answer this question. This is important to determine, as the data obtained from recruitment for this study indicate many breast-feeding mothers do not want to give their babies daily vitamin D supplements.

To improve breast-feeding rates at Ochsner, both initiation and continuation of breast-feeding must be encouraged. While rates of breast-feeding initiation for mothers >25 years of age approach the goal of 75%, we need to improve those rates in mothers who are younger. We also need to improve retention rates for breast-feeding across the first year of life for mothers of all ages. This underscores the need to provide continuing education and support for breast-feeding after the mother has been discharged from the hospital.

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