Maternal Perception of Lactogenesis Time: A Clinical Report

H. Mark Hildebrandt, MD

Abstract

A study evaluating the time between delivery and the surge in milk production (lactogenesis time) determined whether lactogenesis time (LT) is affected by parity, factors in pregnancy and delivery, and especially cesarean section. Forty-six primiparous mothers and 81 multiparous mothers reported the time of sensation of milk production after delivery. The mean LT in the entire sample was 50 ± 15 hours. The mean LT in 46 primiparous mothers was 59 ± 14 hours, and in 81 multiparous mothers 45 ± 12 hours (by student t test, $p<0.01$). Mean LT did not decrease as parity increased in the multiparous mothers. By multivariate analysis, mean LT was 44 hours in multiparous mothers who delivered vaginally without medication, 11 hours longer if primiparous, 6 hours longer if delivery by cesarean section, and 13 hours longer if sedative or pain medication were given during labor. J Hum Lact 1999; 15:317–323.

Keywords: predicting lactogenesis, lactogenesis, postpartum, breastfeeding, newborn, cesarean section, maternal perception.

Introduction

It has been the experience of the author that lactogenesis time (LT) occurs later in primiparous mothers than in multiparous mothers. We have also noticed that cesarean section may delay LT. The present study was undertaken to try to determine whether LT was in fact different in primiparous mothers and multiparous mothers, and whether factors related to pregnancy and delivery affect LT. It is important to know when to expect milk production to increase when counseling mothers who intend to breastfeed in order to help them through some of the discouragement associated with the wait for active milk production.

Received for review, October 16, 1997; revised manuscript accepted for publication, July 12, 1999.

H. Mark Hildebrandt is in private practice and is associate professor of pediatrics at the University of Michigan Depart of Pediatrics. He is a member of the American Academy of Pediatrics, the Ambulatory Pediatric Association, and the Academy of Breastfeeding Medicine. Address correspondence to: HMH, 5333 McAuley Dr., R6011, Ypsilanti, MI 48197 USA.

The author gratefully acknowledges the assistance of Elsie Lovelace, RN(C), for her assistance in collecting data. We also wish to thank Ruth Lawrence, MD, for her valuable suggestions, Professor Tony Schork and Leslie Lange of the Department of Biostatistics, School of Public Health, University of Michigan, for the statistical analysis of data, and Richard Lampman, PhD, Department of Surgery, St. Joseph Mercy Hospital, for his kind critiques and coaching.

J Hum Lact 15(4), 1999

Although the timing of the increase in breast milk production (lactogenesis time) after delivery has been reported[1-8] only a few[5,6,9,10,11] reports relate the lactogenesis time (LT) to parity or mode of delivery. In many animal species, there is increased milk production just before or at the time of delivery.[12] In humans, colostrum is available for the baby after delivery and milk production increases after the first few days. Several studies of daily milk intake in breastfed infants in the first several days of life show a rapid increase after 24-72 hours.[1,2,3,4,8] Schutzman et al.[5] found the mean LT based on maternal reports to be 54-56 hours. Kulski and associates[6] reported that the mean time of mothers' sensation of milk "coming in" was 59 hours in 107 women with vaginal deliveries and 63 hours in 57 women who delivered by cesarean section.

By the second trimester of pregnancy, glandular secretion of colostrum occurs. Hartman[13] suggested "lactogenesis stage I" to refer to the changes in the mammary gland that occur during pregnancy and result in colostrum production, and "lactogenesis stage II" to refer to the onset of copious milk secretion several days after delivery. In this paper, lactogenesis time or LT refers to the time in hours between delivery and Hartman's lactogenesis stage II. After delivery, milk production does not depend on whether the baby is breast or bottle fed but is induced by the increase in prolactin as a result of the decline in placental progesterone, a prolactin inhibitor.[14,15] Since milk induction is hormonally determined, women who bottle feed their babies commonly experience milk induction, which has been suppressed in the past with estrogen plus high-dose testosterone (Deladumone) or bromcriptin, an antiprolactin agent. Once milk production is initiated, it is regulated by the frequency and the amount of milk removed by the baby nursing at the breast or by manual or mechanical expression.[16]

In 1748, William Cadogan, the father of pediatrics, noted that "the mother's milk seldom comes in 'till the third day.'"[17] Standard breastfeeding references vary in their descriptions of LT from 2 to 3 days[18] to the second to fourth postpartum day.[14] Studies of milk production after delivery by expression[12] or by test weighing[4,5] consistently show that a mother's milk production or an infant's intake increases on the second to fourth day. Babies are usually alert and interested in nursing immediately after delivery, but within an hour enter a 2 to 6 hour quiet period during which they are sleepy and not interested in feeding, the transition period described by Desmond.[19] Following this quiet period, stooling starts, spitting-up decreases, and the baby commonly seems to be more interested in nursing.[20] Since colostrum volume averages 30-56ml on the first day,[2,5,6] there is inadequate nutritional intake which results in a drop in the infant's weight of 6% to 10% in the first 2 days. Until lactogenesis occurs, the baby may not nurse enthusiastically. As milk production increases, the baby commonly nurses more eagerly and more frequently and weight increases 30 to 60 grams per day. It is especially helpful for the first-time mother, usually anxious about whether nursing will be successful, to have some idea about when her baby will begin to get ample milk.

Subjects and Methods

This study consisted of a convenience sample of 123 mothers who elected to breastfeed their babies and delivered between August 1981 and November 1984. There were 127 mother-baby pairs because 4 mothers had a baby twice during the study. Except for 1 home birth, the babies were delivered in either the community hospital, St. Joseph Mercy Hospital, or the Women's Hospital of the University of Michigan Medical Center, both in or near Ann Arbor, Michigan. The babies were usually allowed to nurse immediately after delivery and were breastfed on demand during the day. It was common practice in the hospitals at the time of the study for all babies to be fed in the nursery at night.

The average age of the entire sample was 29.2 ± 4.8 years, 3 years older than the average age of mothers who delivered in 1983 in Washtenaw County, Michigan,[21] the time and locale of the present study. Five percent of the sample were African American and 3% were Asian. In 1984, 6.9% of the mothers who delivered at St. Joseph Mercy Hospital, the hospital at which most of the mothers in this study delivered, were African American, and 0.5% were Asian.

One hundred twenty-seven breastfeeding mothers who delivered during the period of the study were excluded because of missing data on timing of lactogenesis. The excluded mothers were not significantly ($p<0.01$) different from the study mothers with respect to parity, mean age, or mean birth weight of their babies (Table 1).

In this report, LT is defined as the number of hours between delivery and the time that each mother first observed the signs of a surge in milk production. Every mother-baby dyad was visited within the first 24 hours after delivery. The pregnancy, labor, and delivery were reviewed and the infant was examined at the bedside. At that visit, the mother was asked if she intended to breastfeed or bottle feed her baby. If the mother stated that she intended to breastfeed, the indications or sensations of milk production were described, including a prickly feeling or tingling in the breast, dripping from the contralateral nipple when the baby nursed, milk running from the baby's mouth, and gulping by the baby. The mother was asked to note the time that she first noticed milk production occurring. Congestion, fullness, or engorgement of the breast was described as occurring before actual onset of lactogenesis and was not considered indicative of increased milk production. The mothers were visited daily in the hospital. The mothers' report of milk "coming in" and the babies' daily weight were recorded on the infants' newborn chart. At the time of the study, mothers were hospitalized for 3 or 4 days after vaginal delivery and 5 or 6 days after cesarean delivery. Lactogenesis usually occurred in the hospital and the infant's weight had usually started to increase before discharge. Eight mothers were either discharged 24 to 48 hours after delivery or went home before

Table 1. Comparison of study and excluded subjects.

	Study Subjects N=127	Excluded Subjects N=127	p value*
Primiparous	36%	44%	
Multiparous	64%	56%	0.02
Mean Age	29.2 ± 4.8y	28.0 ± 4.6y	0.02
Mean Birth Wt Infant	3514 ± 468g	3427 ± 460g	0.07
Male Infants	55%	55%	1

*By t-test or chi-square test.

lactogenesis had occurred. They were contacted by phone daily until infant weight gain was documented. Maternal age was recorded as the age at the last birthday. Parity is the number of previous deliveries. Gravidity is the number of previous pregnancies. Abortions is the number of previous pregnancies not carried to term. Medications in labor include analgesics and sedatives. Anesthesia includes epidural, spinal, or general anesthesia, but excludes local anesthetic. Mode of delivery includes unassisted, low forceps, midforceps, and cesarean section deliveries. Infant birth weight, gestational age, and Apgar ratings at 1 and 5 minutes were recorded as such. Infant weight loss is the difference between the birth weight and the lowest weight observed. Infant peak bilirubin and the day of the peak was recorded for those infants that were clinically jaundiced.

Statistical analyses were performed using the SAS[22] program in collaboration with statisticians in the Department of Biostatistics, University of Michigan School of Public Health. Means, standard deviations, and frequencies were compiled for each variable. Student's t test was used to assess whether means from 2 subsets could occur by chance alone to compare study mothers and those excluded. Analysis of variance (ANOVA) was used to test whether the mean LTs among several subsets were equal. In addition, chi square tests were computed to compare categorical variables such as type of delivery and parity. A p value of <0.05 was used to declare statistical significance. Least squares multiple regression was used to determine whether there was a linear relationship between LT and maternal age, infant birth weight, gestational age, or infant weight loss. Multivariable analysis was accomplished using various sets of variables to identify the set most likely to affect LT. The following variables were analyzed as trial models in various combinations: maternal age, parity (1 vs 2 or more), gravidity (1 vs 2 or more), prior abortions (yes or none), problems in pregnancy (yes or none), medication in labor (yes or none), anesthesia (yes or none), delivery type (vaginal or cesarean section), Apgar rating at 1 minute, infant birth weight, gestational age, and infant weight loss. The final model contains the following independent variables that were found to be significant in the trial models: parity, mode of delivery, and medications in labor. This model will be identified as the final multivariable model in subsequent discussion.

Results

The sample of 46 primiparous mothers and 81 multiparous mothers is characterized and compared with the 127 excluded mothers who breast fed during the period of the study in Table 1. The study sample is characterized and the primiparous mothers and their infants are compared with the multiparous mothers and their infants in Table 2. The primiparous mothers were younger than the multiparous mothers (mean ± SD) 26.6 ± 4.4 years vs 30.4 ± 4.4 years (p<.01), as would be expected. Eight primiparous (21%) mothers and 5 multiparous mothers (7%) received pitocin in labor (p=0.05). The mean ± SD 1-minute Apgar score was lower in the

Table 2. Study subject characteristics: primiparous and multiparous subjects compared.

Overall Maternal Factors			
Age, y, x̄ + SD, range	29 ± 5	18-43	
LT, h, x̄ + SD, range	50 ± 15	24-96	
Maternal Factors by Parity			
	Primiparous *N*=46	Multiparous *N*=81	*p* value
Age, y, x̄ + SD	26.6 ± 4.4	30.3 ± 4.4	<0.01
History of abortion	14 (30%)	28(33%)	NS
Complications of pregnancy	7(15%)	17(21%)	NS
Medication in labor (sedatives and analgesics)	10(21%)	1 (1%)	<0.01
Pitocin in labor	10 (21%)	6 (7%)	<0.05
Local or no anaesthetic	28 (62%)	65 (80%)	NS
Cesarean Section	11 (24%)	15 (19%)	NS
Infant Factors by Maternal Parity			
Birth weight, g, x̄ ± SD (n)	3465 ± 415 (45)	3521 ± 437 (81)	NS
Gestational age, wk, x̄ ± SD (n)	39 ± 1 (42)	37 ± 1(77)	NS
1-min Apgar, x̄ ± SD (n)	7 ± 1 (39)	8 ± 1 (78)	0.01
5-min Apgar, x̄ ± SD (n)	9 ± 1 (39)	9 ± 1 (78)	NS
Weight loss, g, x̄ ± SD (n)	176 ± 102 (44)	200 ± 97 (70)	NS
Bilirubin >205 μmol/L (n)	13% (6)	20% (16)	NS

infants of primiparous mothers than in the infants of multiparous mothers (7.3 ± 1.1 vs 8.0 ± 1.0, p=0.01). The shortest LT was 24 hours and the longest 96 hours. The mean ± SD LT for the entire sample was 50 ± 14 hours, or a little more than 2 full days. The LTs for some of the variables are listed in Table 3.

Parity

In the sample of primiparous mothers, LT ranged from 31 to 96 hours, whereas in the sample of multiparous mothers it was between 24 and 80 hours. The mean ± SD LT time was 59 ± 14 hours for the 46 primiparous mothers and 45 ± 12 hours for the 81 multiparous mothers, a significant difference by t test (p<0.01). The mean ± SD LT time in the 55 mothers with 2 previous deliveries was 45 ± 11 hours, in the 23 mothers with 3 previous deliveries it was 48 ± 16 hours, and in the 3 mothers with 4 previous deliveries it was 42 ± 18 hours. There was no significant difference between these 3 groups by ANOVA. In the multivariable analysis, multiparity decreased LT by 11 hours compared with primiparity.

Maternal Age

There was no correlation between LT and maternal age for the entire sample by least squares regression analysis (r=0.08). However, as the age of primiparous mothers increased, least squares regression indicated that the LT time increased about 1 hour per year (r=0.33 and p=0.02). There was no relationship between maternal age of the multiparous mothers and the LT by least squares regression analysis (r=0.012).

Medication in Labor

Eleven mothers who received medication in labor had a mean ± SD LT of 63 ± 14 hours. Of the sedative and analgesic medications given in labor, only promethazine (Phenergan) was associated with a significant difference in LT. The 6 mothers who received promethazine (including 3 who also received meperidineHCl (DemerolHCl) and 2 who also received secobarbital(Seconal) and meperidineHCl) had a mean ± SD LT of 68 ± 16 hours, in contrast to the mean ± SD LT of 56 ± 7 hours of the 5 mothers who received secobarbital or meperidine but did not receive promethazine. In the multivariable model, medication in labor increased LT by 13 hours.

Mode of Delivery

For the entire sample, the mean ± SD LT for all 101 vaginally delivered mothers was 49 ± 15 hours, while the mean ± SD LT for the 91 mothers with uncomplicated vaginal deliveries (excluding 10 who had low- or mid-forceps deliveries) was 47 ± 13 hours. The 26 mothers who delivered by cesarean section had a mean ± SD LT of 56 ± 13 hours, a significant difference (p=0.03). However, in the subset of primiparous mothers, there was no significant difference in the mean ± SD LT between the 12 cesarean section delivered mothers (57 ± 12 hours) and the 30 uncomplicated vaginally delivered mothers (57 ± 12 hours). However, in the multivariable analysis, cesarean section increased the LT by 6 hours. For the 15 multiparous mothers who delivered by cesarean section, the mean ± SD LT was 54 ± 12 hours, significantly longer (p<0.01) than the 42 ± 11 hours of the 49 multiparous mothers with uncomplicated vaginal deliveries.

Infant Factors

Least squares regression indicated no significant relationship between LT and infant birth weight, gestational age, or infant weight loss. Regression did show that as LT increased there was an increase in infant weight loss. However, the relationship had a p=0.105 or a 10% chance of occurring by chance alone. There was

Table 3. Lactogenesis times (mean h) for certain variables.

	No $\bar{x}$ ± SD (n)	Yes $\bar{x}$ ± SD (n)	p value
Parity >1	59 ± 14 (46)	45 ± 12 (81)	p<0.01
Gravidity >1	60 ± 14 (34)	47 ± 13 (93)	p=0.02
Vaginal delivery	56 ± 13 (26)	49 ± 15 (101)	p=0.03
Problems in pregnancy (Smoking, hypertension, diabetes of pregnancy antibiotics)	51 ± 14 (101)	50 ± 16 (26)	NS
Pitocin in labor	50 ± 15 (110)	53 ± 13 (16)	NS
Medication in labor (promethazine, meperidine, secobarbital)	49 ± 14(116)	63 ± 14 (11)	p<0.01
Anaesthesia	47 ± 14 (16)	51 ± 14 (102)	NS

no significant difference in LT in mothers of infants with and without hyperbilirubinemia (bilirubin >205mmol/L(12mg/dL)). In the entire sample, mean LT was longer when the 1-minute Apgar rating was less than 7. However, when the sample was subdivided into primiparous and multiparous mothers, the relationship was no longer significant as there was a higher incidence of low Apgar ratings within the primiparous group.

Multivariate Analysis

In the least squares multiple regression analysis, the most significant variables affecting LT were parity, mode of delivery and medications in labor (Table 4). In the final multivariable model, the basic intercept for LT was 61 hours. Parity>1 (multiparity) decreased this by 11 hours, vaginal delivery decreased it by 7 hours, and medications in labor increased it by 13 hours. Other factors did not reach the level of significance. Hence, at the time of delivery, one could predict that in a primiparous mother with a vaginal delivery and no medication in labor, LT would be 55 hours. For a similar multiparous mother (vaginal delivery, no medication in labor) predicted LT would be 44 hours. In this study, the actual mean times were 56 and 43 hours, respectively.

Table 4. Initial, trial and final multivariate models.

INITIAL MODEL	LT (Coeff) ± SE*	*p* value
Intercept	19 ± 50.0	0.70
Age	0 ± 0.3	0.54
Problems in pregnancy	-1 ± 3.1	0.62
Parity >1	-11 ± 5.5	0.04
Gravidity >1	0 ± 6.2	0.95
Prior abortion	-2 ± 3.7	0.59
Medications in labor	10 ± 4.2	0.02
Anaesthesia	2 ± 4.4	0.60
Vaginal delivery	-6 ± 3.3	0.07
Apgar 1 min	-2 ± 1.1	0.17
Infant birth weight	0 ± 0.0	0.35
Gestation	1 ± 1.3	0.32
Infant weight loss	0 ± 0.0	0.05

Sample size limited to the 87 with complete data
R^2=0.42, overall p=0.0001.

TRIAL MODEL	LT (Coeff) ± SE	*p* value
Intercept	57 ± 48.4	0.24
Age	0 ± 0.3	0.63
Parity >1	-14 ± 3.1	<0.01
Medications in labor	9 ± 4.3	0.05
Vaginal delivery	-6 ± 3.2	0.08
Apgar 1	-1 ± 1.0	0.27
Infant birth weight	0 ± 0.0	0.37
Gestation	0 ± 1.2	0.78
Infant weight loss	0 ± 0.0	0.05

Sample size limited to the 94 with complete data
R^2=0.38, overall p=0.0001

FINAL MODEL	LT (Coeff) ± SE	*p* value
Intercept	61 ± 2.9	<0.01
Parity >1	-11 ± 2.5	<0.01
Vaginal delivery	-6 ± 2.8	0.02
Medications in labor	13 ± 4.0	<0.01

Sample size limited to the 126 with complete data
R^2=0.30, overall p=0.0001

*LT (Coeff) ± SE = Lactogenesis time in hours (Coefficient) ± Standard Error

Discussion

The end point used in this study was the time that the mother noticed an increase in milk production as manifested by increased swallowing by the baby, milk running out of the baby's mouth as he or she was nursing, milk dripping from the other breast when the baby was nursing, or the tingling sensation associated with active ductular contraction. Newton and Newton described these clinical signs in 1962[23] but did not document the accuracy of their association with milk production by measurements of milk produced.

Three different aspects of lactogenesis have been reported: changes in milk composition, changes in the volume of milk produced, and the sensations of "coming in" associated with lactogenesis.

Changes in composition are associated with the transition from colostrum milk to mature milk and are related to the time of delivery. Studies of early milk composition during this transition report an increase in the concentration of lactose, glucose and lipid, and a decrease in protein.[6,7,8,24] The increase in volume of milk produced corresponds closely with the changes in composition.[7,8,24] The sensations of "coming in" are thought to be due to constriction of the mammary myoepithelium in response to oxytocin and occur during the period when milk production is increasing.[6,7] Lau and Henning[25] compared the number of swallows in a pair of breastfeeding babies (ages 12 and 22 months) with test weights and found close correlation with milk intake. Schutzman et al.[5] and Kulski et al.,[6] using mothers' reports of milk "coming in" as the end point, reported LTs of 52-63 hours, consistent with our results. In practice, the clinician or lactation consultant who counsels the breastfeeding mother makes a clinical analysis of LT from the mother's report, the weight of the infant before and after feeding (test weighing), or infant weight gain. A mother's report, though less exact as a research tool, is very useful in practice and, by respecting her description of the process, increases the mother's confidence in her practitioner.

Studies of milk production in the first few days after delivery by expression[11] or test weighing the infant[3,8,7,26] have shown that there is a rapid increase in milk supplied that parellels the mother's sensation of "coming in." Other methods of documenting milk production, such as moiré topography[27] or computerized breast volume determination,[28] have been used to measure milk production in research settings on small numbers of subjects with established lactation but could be upsetting to a postpartum mother trying to initiate lactation for the first time.

Previous pregnancy carried to term prepares the breast for earlier milk production as demonstrated by the shorter LT in multiparous than primiparous mothers. Zuppa et al.[10] reported lower basal serum prolactin levels in multiparous mothers and increased milk intake in their infants in the first several days postpartum compared with primiparous mothers and their infants. They hypothesized that this finding was related to an increased number of occupied prolactin-receptors in the mammary glands of multiparous mothers.

There is breastfeeding folklore that the time between delivery and increased milk production decreases as the number of pregnancies increases. In this sample of multiparous mothers, the LT times was not significantly different as parity increased above 2.

Medication in labor was determined to be a significant factor in predicting onset of LT in the multivariable model. Promethazine(Phenergan) was associated with an increase in mean LT in 6 mothers compared with the mothers who received other medication in labor and did not receive promethazine. Dopamine agonists, such as the phenothiazines, stimulate prolactin secretion by occupying hypothalamic dopaminergic receptors, thereby blocking dopamine's action as an inhibitor of prolactin secretion.[29] Chlorpromazine, a phenothiazine, has been used to induce lactation and has produced galactorrhea in patients who have been treated with it. Promethazine, also a phenothiazine, would be expected to increase milk production and therefore to shorten the time between delivery and lactogenesis. Therefore, prolongation of the LT in this study is an unexpected finding. The one infant who failed to gain in Saint's study[8] of colostrum and milk yield in the first month was the baby of a mother who had promethazine in labor. Our finding may be linked to the report by Meites and Schelesnyak[30] of complete inhibition of lactogenesis in rats treated with exogenous prolactin.

Cesarean section prolonged LT in multiparous mothers. According to the multivariable model, cesarean section increase LT by 6 hours. In the bivariable analysis (mean LT in vaginal vs cesarean delivery in primiparous mothers) the difference between LT was not significant. It is likely that the difference was masked by the presence of medication in labor in some of the vaginally delivered mothers, increasing the mean. Clearly, surgery has an effect on the milk induction process.

Although there was not a significant relationship between LT and infant birth weight, analysis of variance did show increased weight loss as LT increased. It is intuitive to assume that the longer the baby's nutrition is limited to colostrum, which averages about 30ml per day the first day,[1,8] the greater will be the weight loss.

This study did not evaluate the possible effect of nursery practices or maternal postpartum problems and management on LT, factors that need to be addressed. A large recall study by Pèrez-Escamilla et al.[31] suggests that milk or water feedings before lactogenesis may delay lactogenesis. Other reports indicate that feeding before lactogenesis occurs had no effect on milk production over the first 5 days[8] or breastfeeding rate at 1 month.[9]

Clinical practice commonly involves anticipating or predicting outcomes. The results of this study can be used by the clinical practitioner counseling the new mother at the bedside to predict when her milk production is likely to increase. By knowing approximately when milk production is going to increase, the physician, lactation consultant, or nurse can reassure the anxious mother during the latent period between delivery and lactogenesis that the delay is perfectly normal. With shorter postpartum hospitalizations, mothers are commonly discharged before milk production increases. The shorter hospitalization increases the pressure on the nursing staff and lactation consultants in the hospital to provide lactation education and to determine that the mother-baby dyad is nursing well enough to be discharged. Knowing when to expect milk production to increase can help the hospital staff reassure mothers who are worried about their nursing.

Summary

In this study, mean ± SD lactogenesis time (LT) in 127 mothers was 50 ± 15 hours. By multivariable analysis, LT was affected by parity, mode of delivery and medications in labor. The multivariable analysis model based on the data in this study predicts that LT for a multiparous mother with uncomplicated vaginal delivery and no medication in labor would be 44 hours, an additional 11 hours in primiparous mothers, 6 hours more if delivery was by cesarean section, and a further 13 hours if pain and sedative medications were given in labor. Each of these factors is additive.

References

1. Casey CE, Neifert MR, Seacat JM, Neville MC. Nutrient intake by breast-fed infants during the first five days after birth. Am J Dis Child 1986; 140:933–36.
2. Hartman PE, Prosser CG. Physiological basis of longitudinal changes in human milk yield and composition. Fed Proc 1984; 43:2448–53.
3. Houston MF, Howie PW, McNeilly AS. Factors affecting the duration of breast feeding: 1. Measurement of breast milk intake in the first week of life. Early Hum Dev 1983; 8:49–54.
4. Neville MC, Keller RP, Seacat JM et al. Studies in human lactation: Milk volumes in lactating women during the onset of lactation and full lactation. Am J Clin Nutr 1988; 48:1375–86.
5. Schutzman DL, Hervada AR, Branca PA. Effect of water supplementation of full term newborns on arrival of milk in the nursing mother. Clin Pediatr 1986; 25:78–80.
6. Kulski JK, Smith M, Hartman PE. Normal and cesarian delivery and the initiation of lactation in women. Aust J Exp Biol Med Sci 1981; 59:405–12.
7. Arthur PG, Smith M, Hartman PE. Milk lactose, citrate, and glucose as markers of lactogenesis in normal and diabetic women. J Pediatr Gastoenterol Nutr 1989; 9:488–96.
8. Saint L, Smith M, Hartman PE. The yield and nutrient content of colostrum and milk of women from birth to 1 month post-partum. Br J of Nutr 1984; 52:87–95.
9. Vestermark V, Hfgdall CK, Birch M, Plenov G, Toftager-Larsen K. Influence of the mode of delivery on initiation of breast-feeding. Eur J Obstet Gynecol Reprod Biol 1991; 38:33-38.
10. Zuppa AA, Tornesello A, Papacci P et al. Relationship between maternal parity, basal prolactin levels and neonatal breast milk intake. Biol Neonate 1988; 53:144–47.
11. Roderuck C, Williams HH, Macy IG. Metabolism of women in the reproductive cycle: VIII. The utilization of thiamin during lactation. J Nutr 1946; 32:267–83.
12. Cowie AT, Forsyth IA, Hart IC. Hormonal control of lactation. In: Gross F, Labhart A, Mann T, Zander J, eds. Monographs on Endocrinology. Berlin: Springer verlag, 1980; 15:154.
13. Hartman PE. Changes in composition and yield of The mammary secretion of cows during the initiation of lactation. J. Endocrinol 1973; 59:231–47.
14. Neville MC. Regulation of mammary development and lactation. In: Neville MC, Neifert MR, eds. Lactation, Physiology, Nutrition, and Breast-Feeding. New York: Plenum Press, 1983:112.
15. Hartman PE. Changes in the composition and yield of the mammary secretion of cows during the initiation of lactation. J Endocrinol 1973; 59:231-247
16. Daly SEJ, Kent JC, Owens RA, Hartman PE. Frequency and degree of milk removal and the short-term control of human milk synthesis. Exp Physiol 1996; 81:861–75.
17. Cadogan, W. An essay upon nursing and the management of children from birth to three years of age. In: Rendle-Short M, The Father of Child Care: Life of William Cadogan (1711-1797). Bristol, UK: John Wright & Sons, 1966:69.
18. Lawrence RA. Breastfeeding, a Guide for The Medical Profession, 4th ed. St. Louis, MO: Mosby, 1994:63.
19. Desmond RA, Phitsakspharaiwan P. The transitional nursery, a mechanism for preventive medicine in the newborn. Pediatr Clin North Am 1966; 13:651–68.
20. Klaus M, Fanaroff AA. Care of The High Risk Newborn. Philadelphia, PA: W. B. Saunders, 1979:54–55.
21. Washtenaw County Health Department. Annual report. Ann Arbor, MI, 1983
22. Statistical Analysis System (SAS), Version 6.12. SAS Institute, Inc. SAS Campus Drive, Cary, NC 27173.
23. Newton M, Newton N. The normal course and management of lactation. Clin Obstet Gynecol 1962; 5:41–63.
24. Neville MC, Allen JC, Archer PC et al. Studies in human lactation: Milk volumes and nutrient composition during weaning and lactogenesis. Am J Clin Nutr 1991; 54:81–92.
25. Lau C, Henning SJ. A noninvasive method for determining patterns of milk intake in the breast-fed infant. J Pediatr Gastoenterol Nutr 1989; 9:481–87.
26. DeCarvalho M, Robertson S, Friedman A, Klaus M. Effect of frequent breast feeding on early milk production and infant weight gain. Pediatrics 1983; 72:307–11.
27. Arthur PG, Jones TJ, Spruce J, Hartman PE: Measuring short term rates of milk synthesis in breast-feeding mothers. Quart J Exp Physiol 1989; 74:419–28.
28. Daly SEJ, Kent JC, Huynh DQ et al. The determination of short-term breast volume changes and the rate of synthesis of human milk using computerized breast measurement. Exp Physiol 1992; 77:79–87.
29. Ehrenkranz RA, Ackerman BA. Metoclopramide effect on faltering milk production by mothers of premature infants. Pediatrics 1986; 78:614–20.
30. Meites J, Shelesnyak MC. Effects of prolactin on duration of pregnancy, viability of young and lactation in rats. Proc Soc Exp Biol Med 1957; 94:746–49.
31. Pèrez-Escamilla R, Segura-Millàn S, Canahuati J. Prelacteal feeds are negatively associated with breast-feeding outcomes in Honduras. J Nutr 1996; 126:2765–73.

Percepción materna del momento de la lactogenesis, Reporte Clínico (Maternal Perception of Lactogenesis Time: A Clinical Report)

Resumen

Un estudio del intervalo de tiempo (LT) entre el parto y la sensación de producción de leche (lactogenesis) determinó si la lactogenesis esta afectada por la paridad, factores durante el embarazo y parto, y especialmente cesárea. Cuarenta y seis primíparas y 81 multíparas reportaron el momento de tener una sensación de producción de leche después del parto. La mediana de Desviacion Estandard (DE) del intervalo de tiempo de lactogenesis (LT) en toda la muestra fué de 50 ± 15 horas. La mediana del intervalo de tiempo de lactogenesis en 46 primíparas fue de 59 ± 14 horas, y en 81 multíparas entre 45 ± 12 horas (Student t test, $p<0.01$). La mediana LT no disminuyó a medida que aumentó la paridad en las multíparas. Luego de un análisis multivariado, la mediana LT fué de 44 horas en multíparas con partos vaginales sin medicación, 11 horas más para las primíparas, 6 horas más en las mujeres con parto por cesárea y 13 horas más si se utilizaron sedantes o medicación analgésica durante el trabajo de parto.