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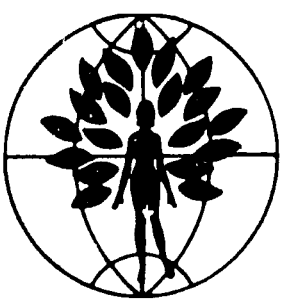

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Breastfeeding and return to ovulation in Bangkok

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Abstract

Twenty-seven breastfeeding mothers and nine non-breastfeeding postpartum comparison mothers in Bangkok, Thailand were followed longitudinally until ovulation resumed. A simple set of guidelines is described involving three obvious milestones for the breastfeeding mother to safely use the natural contraceptive benefit of breastfeeding. Those milestones are the first menses, the initiation of supplementation and the child's monthly birthday. In the absence of menses and supplementation, 93% of breastfeeding mothers remained anovular for 3 months postpartum and 88—89% for up to 6 months. Further, the work of other investigators suggests that the proportion ovulatory provides an overestimate of those at risk of pregnancy. The guidelines suggest a way to estimate the period of lactational infertility and may be most useful on a programmatic level.

Keywords: Breastfeeding; Thailand; Fertility; Ovulation; Program; Guidelines.

Introduction

Breastfeeding is nutritionally ideal for infants, is optimally compatible with the infant gastrointestinal system, and confers immunological protection. Breastfeeding also delays the resumption of maternal fertility postpartum [1—5,9,12,18—21,23]. Full and on-demand breastfeeding is thought to lengthen postpartum anovulation while the introduction of supplementary foods is often associated with a more rapid return of ovulation [8]. Neither exclusive nor frequent breastfeeding, however, can guarantee anovulation [22].

Ovulation may either precede or follow the onset of the first postpartum menstrual period [8,9,22]. Estimates of the percent of ovulations that are not preceded by a herald bleed range from 33 to 78 [9,19]. Studies reviewed by Van Ginneken show that pregnancy rates during lactational amenorrhea vary greatly, ranging from 8 to 17 per 100 women per year [25].

The current study, in Bangkok, Thailand, was conducted to identify the predictors of the resumption of ovulation in lactating mothers. Despite the wealth of research about breastfeeding and fertility in Thailand [13—16,24,26,27], to our knowledge, no study has ever measured the actual return of ovulation after childbirth. The current study determines the timing of the first postpartum ovulation during breastfeeding and its relationship to the first postpartum menses, to the introduction of regular supplements, and to the baby's age, in order to construct guidelines for determining when postpartum contraception should be initiated for child spacing.

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Materials and methods

All volunteers in the study were between the ages of 20 and 35, were healthy, had no previous history of infertility or gynecologic problems, proposed to use no or non-steroidal contraception, had delivered a healthy full-term infant in the 2 weeks prior to administration into the study, clearly understood the implications of the study, were accessible and agreeable to long-term follow-up in their homes on a weekly basis and gave informed consent. Breastfeeding mothers needed to express the intention to breastfeed for at least 3 months.

On weekly follow-up visits, a trained nurse gave each breastfeeding volunteer a pictorial chart for the forthcoming week on which to record each suckling episode and duration per day and per night, each supplementary feeding, and the occurrence of coitus, and collected the completed pictorial chart for the previous week. The baby was examined and questions were answered about vaginal bleeding, the use of contraception and the health of the mother and child. Weekly follow-up was continued until subsequent pregnancy occurred, until two or more consecutive ovulatory cycles occurred, until the use of systemic contraception was begun, or until the mother desired to withdraw from the study.

Each volunteer collected a 12-h overnight urine sample once per week. The Jaffe method was used to assay for creatinine [11]. Radioimmunoassay for pregnanediol-3-a-glucuronide was performed according to the methodology of the World Health Organization (WHO) Special Programme of Research at a collaborating center in the WHO matched reagents protocol. Ovulation was determined to have occurred if a sustained rise in urinary pregnanediol per gram creatinine exceeded 1.0 mg and was followed by either vaginal bleeding or conception. Since pregnanediol was measured only once a week, the date of ovulation is estimated at 4 days before the date that elevated pregnanediol was observed (since ovulation probably occurred between 1 and 7 days prior to the rise). Conception was defined as three consecutive weeks of elevated pregnanediol confirmed by a pregnancy test.

The first postpartum menses was defined as the first vaginal bleeding episode which the mother perceived to be menses. Spotting episodes (usually associated with intercourse or IUD insertion) were not considered to be menses.

The time of the introduction of supplements was determined retrospectively as the date of the first follow-up in which either liquid or semi-solid foods (excluding water and vitamins) other than breastmilk were fed to the child on a thereafter regular basis. In this data set, this definition has the effect of ignoring only isolated episodes of single feedings which were thought to have little impact on either the baby's appetite or the suckling frequency.

Pregnancy rates were compared between the groups by constructing ratios of the number of pregnancies to the number of days of exposure to pregnancy in each group. The days of exposure to pregnancy were counted as the number of days from delivery until insertion of an IUD, until termination from the study or until conception. The Kaplan Meier lifetable method was used to determine the median times to first menses and to first ovulation, with the differences between distributions tested by the Breslow statistic [17].

Results

Patient characteristics

Twenty-seven breastfeeding women and nine non-breastfeeding controls were recruited into the study. All received ante-, intra- and postpartum care at the Pramongkutklao Army Hospital in Bangkok. Both the volunteers and their husbands reported a range of occupations, but at the time of the study, the volunteers were generally housewives. Although the study was conducted in Bangkok, 78% of the breastfeeding women and 56% of the non-breastfeeding women

were from the countryside as temporary migrants to find jobs. Eight of the nine control group volunteers had experienced fetal deaths, neonatal deaths or stillbirths immediately prior to admission into the study, which was their reason for not breastfeeding (Table I). The controls were marginally younger and better educated and were more likely to be from urban areas and to work outside the home than the cases.

The mean time until the first postpartum coitus was 58 days for the breastfeeding women and 47 days for those not breastfeeding. No difference between the groups in coital frequency per week was observed.

Conceptions

Among the seven breastfeeding women who conceived, one became pregnant before the introduction of supplements and the remainder after. All were breastfeeding, during the day and at night, at the time of the conception. The frequency of breastfeeding per 24 h at the time of conception ranged from 5 to 13 episodes. The seven conceptions occurred between 3 and 13 months postpartum. No mother conceived during postpartum amenorrhea. Between 2 and 6 menses preceded the conceptions.

The earliest conception among the cases occurred at about postpartum (pp) day 93 in the mother who was fully breastfeeding. The conception occurred at the time of her second ovulation, and after her second bleeding episode.

One breastfeeding mother conceived at her first postpartum ovulation (at about pp day 100). The cycle and conception were preceded by both a non-ovulatory bleeding episode (beginning on pp day 61) and the introduction of supplements (on pp day 47).

The three conceptions among the controls occurred at about 3.5, 5.5 and 13 months postpartum. No conception occurred during postpartum amenorrhea or at the time of the first ovulation.

The rates of conception were 35.7 per 100 woman-years for the cases and 63.0 per 100 woman-years for the controls. The rate for the controls was 1.8 times greater than that for the cases. This difference was not tested for statistical significance because condom

Table I. Characteristics of volunteers.

	Cases ($N = 27$)	Controls ($N = 9$)
Residence of origin		
urban (%)	22	44
rural (%)	78	56
Age at delivery		
mean	25.2	24.3
range	20—32	20—30
Years of education		
mean	5.3	8.9
range	0—13	4—14
Work outside home (%)	4	44
Want no more children (%)	26	11
No family planning used before this pregnancy (%)	41	44
Sex of infant		
male (%)	56	56
female (%)	44	44
Number of live births		
mean	2.2	1.1
range	1—6	0—3
range	1—6	0—3
Number of stillbirths		
mean	0.04	0.44
range	0—1	0—1
Number of spontaneous abortions		
mean	0.33	0.33
range	0—3	0—1
Number of induced abortions		
mean	0.11	0.22
range	0—2	0—2
Frequency of coitus		
mean (per week)	1.01	1.14
range	0—7	0—5
Reason for termination from study		
pregnant (%)	26	33
2+ ovulations(%)	44	67
1 year in study (%)	19	—
started oral contraceptives (%)	4	—
personal reasons (%)	7	—

use was sometimes erratic or inaccurately reported in both cohorts, causing doubt about the validity of the denominator as a true representation of exposure to pregnancy.

Return to menses

The median time to first menses was 39 days for the controls and 184 days for the cases. This difference was significant ($P < 0.0001$). All controls menstruated by pp day 47 compared with two of the 27 cases. Ovulation preceded menses in four of the nine controls (44%) and seven of the 23 cases (30%). In both of the early-menstruating breastfeeders, ovulation did not precede menses.

Return to ovulation

Seventy percent of the breastfeeding mothers and all the non-breastfeeding controls ovulated during the study. The median times to first ovulation (57 days for controls vs. 249 days for cases) were significantly different between the two groups ($P < 0.0001$). By 3 months postpartum all controls had ovulated at least once whereas only a quarter of the breastfeeding mothers had done so. The earliest postpartum ovulation among the non-breastfeeding controls was estimated to have occurred on about pp day 27.

The earliest ovulation in a breastfeeding mother occurred at about pp day 50. Thereafter the mother ovulated and bled at regular intervals. At the time of her first ovulation she was breastfeeding 9 times per 24 h. Regular supplementation did not occur until the time of her second ovulation. Three other breastfeeders ovulated during the first 3 months postpartum, on approximately pp days 65, 71 and 77 (all within the third pp month). None of the three mothers had introduced supplements, and they were breastfeeding 9, 10 and 13 times per 24 h, respectively. A herald menses occurred in two cases, and none resulted in pregnancy.

Breastfeeding frequency at the time of first ovulation

At the time of the first ovulation, the 19 breastfeeding mothers were nursing on average 5 times per day and 4 times per night, with the frequency per 24 h ranging from 0 to 15 episodes. Table II shows the mean breastfeeding frequencies at the time of ovulation according to the time from delivery to the first ovulation for the 19 breastfeeding mothers who ovulated during the study. Neither the small decrease in frequency over time nor the wide range of values observed suggests that breastfeeding frequency is a strong correlate of the duration of lactational anovulation.

Predictors of ovulation

In order to determine whether some sign or signs apparent to the mother could have served as a predictor of the onset of fertility, the dates of three fertility-related events were

Table II. Breastfeeding frequencies at first ovulation by time of first ovulation.

Time of first ovulation	*N*	Mean (range) breastfeeding frequency		
		Per day	Per night	Per 24 h
Months 1—3	4	6.3 (5—8)	4.0 (3—5)	10.3 (9—13)
Months 4—6	5	6.8 (3—9)	4.6 (3—6)	11.4 (6—15)
Months 7—9	7	4.7 (0—8)	2.9 (0—5)	7.6 (0—13)
Months 10—12	2	4.5 (2—7)	4.0 (3—5)	8.5 (5—12)
> month 12	1	3.0 (3—3)	5.0 (5—5)	8.0 (8—8)
Total	19	5.5 (0—9)	3.8 (0—6)	9.3 (0—15)

Table III. Predictors of ovulation: percent of women in which the event(s) predicted (preceded) ovulation.

	Cases			Controls		
	Percent	(95% CI)[a]	N[b]	Percent	(95% CI)[a]	N
A single event						
First vaginal bleeding episode	70	(51,89)	23	56	(24,88)	9
Initiation of supplements	81	(66,96)	26		N.A.	
Cessation of night breastfeeding	10	(0,23)	20		N.A.	
3 month birthday	85	(72,98)	27	0	—	9
4 month birthday	78	(62,94)	27	0	—	9
5 month birthday	74	(57,91)	27	0	—	9
6 month birthday	65	(47,83)	26	0	—	9
Two events						
Initiation of supplements or first bleeding episode	89	(77,100)	27		N.A.	
Initiation of supplements or 3-month birthday	85	(72,98)	27		N.A.	
First bleeding episode or 3-month birthday	93	(83,100)	27	56	(24,88)	9
Initiation of supplements or 4-month birthday	81	(66,96)	27		N.A.	
First bleeding episode or 4-month birthday	89	(77,100)	27	56	(24,88)	9
Initiation of supplements or 5-month birthday	81	(66,98)	27		N.A.	
First bleeding episode or 5-month birthday	85	(72,98)	27	56	(24,88)	9
Initiation of supplements or 6-month birthday	81	(64,98)	21		N.A.	
First bleeding episode or 6-month birthday	78	(62,94)	27	56	(24,88)	9
Three events						
Initiation of supplements or first bleeding episode or 3-month birthday	93	(83,100)	27		N.A.	
Initiation of supplements or first bleeding episode or 4-month birthday	89	(77,100)	27		N.A.	
Initiation of supplements or first bleeding episode or 5-month birthday	89	(77,100)	27		N.A.	
Initiation of supplements or first bleeding episode or 6-month birthday	88	(77,100)	26		N.A.	

[a]95% confidence interval = $p + 1.96$ (SE) where p = percent and SE = $\sqrt{p(1-p)/N}$.
[b]In some cases neither ovulation nor the "event" occurred, making it impossible to determine whether the "event" was a viable predictor of ovulation.

compared with the date of the first ovulation to see whether the events preceded the first ovulation. The observable milestones "menses", "supplementation" and "baby's age" were used as proxies for ovarian activity, amount of breastfeeding and time postpartum, respectively. In 70% of cases and 56% of controls, the first menses preceded the first ovulation (Table III). In 81% of the breastfeeders, the initiation of supplements occurred prior to the first ovulation. (The cessation of night breastfeeding preceded only 10% of ovulations.) The baby's 3-month birthday occurred before ovulation in 85% of the breastfeeders, and the 4-, 5- and 6-month birthdays were predictors 78%, 74% and 65% of the time. All controls ovulated prior to the 3-month anniversary of parturition. Since a large proportion of controls also ovulated before bleeding, the postpartum milestones were essentially useless in the prediction of ovulation in the non-breastfeeding control group.

Among the breastfeeding women, since any single milestone was relatively useful as a precursor to ovulation, the simultaneous use of two or more potential signs predicted even more ovulations. In 89% of the lactating women, either supplementation or bleeding came before the first ovulation (Table III). Bleeding or the 3-month birthday preceded 93% of the ovulations. Bleeding and the fourth, fifth and sixth month birthdays predicted 89%, 85% and 78% of the ovulations. Finally, 93% of ovulations were predicted by using the three signs simultaneously, namely supplementation, bleeding or the 3-month birthday.

Discussion

Significant differences in the times until the first postpartum ovulation and menses were observed between the breastfeeding mothers and their non-breastfeeding counterparts. Among the case mothers, however, breastfeeding frequency was not related to the time to fertility return. Other researchers have also reached this conclusion [7,10]. Breastfeeding frequency — only one dimension of the breastfeeding stimulus — may not be an adequate measure of the amount of suckling that occurs, especially when the duration of breastfeeding is extended. In other words, breastfeeding was significantly related to prolonged anovulation but breastfeeding frequency may have been too insensitive or simplistic a measure of breastfeeding to reflect it. The introduction of supplements was a meaningful antecedent to the first ovulation. When used as an obvious milestone with menses and the child's 3-month birthday, 93% of the first ovulations were predicted in this study (descending to 88% by the 6-month birthday)

Table III is a single display of a simple idea: that some ordinary events with indirect relationships to ovulation can be identified by mothers and used as signals to seek family planning services to postpone or prevent a subsequent pregnancy. If supplements are recommended to be introduced by 6 months of age, then family planning needs to be introduced by at least 6 months. Between 78 and 88% of breastfeeding mothers in this small sample could have predicted ovulation before the 6 month mark merely by observing the occurrence of menses or by introducing regular supplements. On the occasion of menses or supplementation before 6 months, family planning assistance should be sought.

The likelihood of ovulating, given a particular population and infant feeding practice, is information of great usefulness to family planning providers, especially in rural areas where the timing of health care outreach is important. Given limited resources, it would be prudent to avoid double protecting mothers with other family planning methods while they are naturally infertile from breastfeeding. In areas where access to family planning is difficult, or where family planning supplies are likely to be consumed or used during the period of natural protection, guidelines such as those suggested by the milestones here may result in better use of family planning

resources. They may even encourage exclusive breastfeeding for up to 6 months, if the child is growing normally.

The percentages ovulatory prior to the signs suggested in Table III are probably overestimates of the risk of conception. Clinical data from Chile [6] applied to population-based menses and pregnancy rates suggest that the risk of pregnancy is five times lower than the risk of ovulating. Likewise, especially for the breastfeeding mothers in this study, the risk of conception is likely to be lower than the risk of ovulation.

The difference in conception rates between the cases and controls appears to be meaningful, and might have been even more profound if the controls had been followed-up as long as the cases. There were no differences between the groups in the frequency of coitus or frequency of condom use, but the pattern of condom use appeared to have been more effective in the control group. Since these mothers were not breastfeeding, cyclic menses appeared much sooner. Those controls who were not seeking a subsequent pregnancy appeared to be using a combination of calendar rhythm and condoms. Appropriately timed periodic use of condoms was not generally possible for the breastfeeders for the majority of their time under observation since cyclicity and termination from the study coincided. As a result, condom use appears to have occurred more randomly in the follow-up period for the breastfeeding cases than for the controls. On the other hand, since the controls completed the study far earlier than the cases, the observation period covered the majority of postpartum anovulation for the controls and lactational anovulation for the cases. This would tend to diminish any bias in the pregnancy rates.

The small numbers of women observed here have influenced both the results and their interpretation. It is not possible to generalize to the Bangkok population from this study, but then the women of Bangkok may have easier access to family planning than their rural counterparts whose more extensive breastfeeding patterns were observed in this study. The technology may soon be more generally available to replicate studies of the recovery of ovulation during breastfeeding in larger numbers. The observation of larger samples would help to confirm or refute the proposition of the simple guidelines to predict ovulation. Equally useful will be studies to see whether family planning workers and breastfeeding mothers would find these guidelines understandable and acceptable.

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