



Breast-feeding and family planning: a review of the relationships between breast-feeding and family planning^{1,2}

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ABSTRACT A number of interrelated factors must be considered when breast-feeding is introduced as a concern for family planning programs: the number of pregnancies and births experienced, age at each pregnancy and birth, duration of the intervals between conceptions, lactation including duration and type, health and nutritional services available to meet the demands of pregnancy, delivery, and postpartum care. The dietary intake of the mother and her health and disease status have an effect on the duration of breast-feeding, and lactation has an effect on her ovulation and birth spacing. Those at particularly high risk include adolescent girls, older grand-multipara women, and families living in poverty. An historical relationship between the reduction in infant and childhood mortality and the falling off of births can be documented. The straightforward benefits on nutritional status of breast-fed infants, in conjunction with the antibody protection afforded by breast milk, served to reduce infant mortality and indirectly served to reduce birth rates. In addition, the prolongation of postpartum anovulatory cycles in breast-feeding women, coupled with sexual mores that postpone sexual relations while a woman is breast-feeding in certain groups, will serve to prolong the interbirth intervals. Populations where breast-feeding is customary have been shown to have fewer births than populations where the women do not breast-feed and where infants are artificially fed. *Am J Clin Nutr* 1982;35:162-171.

KEY WORDS Breast-feeding, family planning

Background

The folklore of many lands fosters the belief that while a woman is breast-feeding she is unlikely to become pregnant. There is some truth to this, and populations in which women traditionally breast-feed tend to grow more slowly than those in which artificial feeding is used, if the use of contraception is similar (1-3). Nevertheless, no one looks upon lactation as a birth control method of choice for individual couples.

From an historical vantage point, we must distinguish between traditional and modern breast-feeding. Traditionally, for the first 6 or more months of life the infant is given the breast on demand many times during the day and night. The modern mode of breast-feeding is usually supplemented from early in-

fancy by other milk and foods, or breast-feeding is conducted on a rigid schedule which usually hampers milk production (4).

Until 50 yr ago when artificial formulas were first mass produced, an infant's survival depended on receiving breast milk, either from his natural mother or from a hired wet nurse or relative (5). If the mother died during childbirth, a surrogate mother had to provide breast milk, or some sort of animal milk had

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to be given. For infants less than 4 to 6 months, most animal milks, unless modified, are difficult to digest and can cause gastrointestinal upsets. Artificial formulas modify animal milk, usually cow's milk, to make it more digestible for the infant. In advertisements infant formulas are referred to as "breast milk substitutes", or "mother's milk approximators", since the alterations attempt to simulate human milk. Fair success has been possible in caloric content and in the major ingredients, protein and fat, with vegetable fats to replace the animal fat. Minerals, such as iron, have been added along with supplementary vitamins.

Many pediatricians promote breast-feeding because it is the soundest nutritional plan designed by nature; it is bacteriologically safe; and it protects the growing infant against infections with transferred antibodies (5). No artificial formula can fully achieve the balance of nutrients found in mother's milk.

Many nutritionists, social scientists, economists, demographers, obstetricians, and other public health workers favor breast-feeding because of the relationship between breast-feeding, infant survival, and family planning. Family planning is particularly of concern in developing countries, where the population is increasing at close to 3% annually, and where there is a high dependency ratio in which nearly half of the population is less than 20 yr of age (6).

Breast-feeding and birth intervals

In a traditional setting all the infants are breast-fed. In one West African village, nearly 300 mothers had a mean period of breast-feeding slightly less than 24 months, the majority breast-fed between 21 and 27 months (7). Only a few women stopped nursing before 15 months, and some continued for 3 yr. They had no domestic animals suitable for milk production.

In that village, pregnancy at first followed the termination of lactation by 2½ months; later pregnancies followed by an interval of 5 months (8). The median interval between births of 34 months was reduced to 17 months with a stillbirth or early infant death. In parts of West Africa there is a cultural taboo inhibiting sexual intercourse during breast-feeding which in traditional societies prolongs

the birth intervals. A birth interval of 3 yr will produce a moderately-sized and well-spaced family (9).

In rural Philippines, in a study of over 2000 women, breast-feeding for 7 to 12 months was associated with a birth interval of 24 to 35 months in more than 50% (10). Similar intervals were found in only 30% of women who artificially fed their children, with actual differences between the groups being more than twice the standard error.

Findings from Europe, India, and Taiwan indicate that women who nursed for 1 to 2 yr and practiced no contraception had birth intervals 5 to 10 months longer than those who did not nurse (11). Lactation had a fertility-reducing effect lasting slightly less than 1 yr; the duration of lactation was directly related to the length of the anovulatory period and conception rates dropped during lactational amenorrhea. Partial breast-feeding is not as effective in delaying ovulation as full or traditional breast-feeding.

Another retrospective study showed that breast-feeding prolongs interbirth intervals by about 4 months in urban areas and by 8 months in rural areas (12). Psychosocial, cultural, and nutritional factors play important roles in determining the duration of breast-feeding and the birth interval. The author calculated that breast-feeding in urban areas of developing countries would annually provide 3.4 million couple-years of protection against fertility, while for rural areas the estimate is 34.7 million couple-years.

Lactational amenorrhea

In general, authors agree that lactation is usually associated with prolongation of postpartum amenorrhea and it has been suggested that a lengthy period of lactation will delay ovulation and, therefore, can be viewed as a period of ovarian inactivity described as "physiological castration." In Central Africa, interviews and medical records of 368 women showed that 9 months after delivery 74% of nonlactating women and 7.6% of lactating women were pregnant (13). It was 2 yr before a similar conception rate was reached by the lactating group. Conception rates of 68% were found in the nonlactating group 6 months after delivery and in the lactating group at 21 months postpartum. Nearly 21% of the lac-



tating women menstruated at 6 months, 48.6% at 12 months, 75% at 24 months and 5.4% remained amenorrheic after 4 yr. It was concluded that the contraceptive effect of lactation had largely disappeared by 27 months after delivery.

A retrospective study in the Philippines demonstrated that breast-feeding has a contraceptive effect that offers as much protection as that provided by all standard contraceptive methods (14). In eleven hospitals, it was found that 79% of women breast-fed their last-born children. Postpartum amenorrhea averaged 8.5 months and the birth interval in breast-feeding noncontraceptors averaged 29.4 months. Nonbreast-feeding women had amenorrhea that averaged 3.5 months with a mean birth interval of 23.9 months. By extrapolation, of the 1.6 million births annually in the Philippines, given an 80% prevalence of breast-feeding, there would be gained 7,200,000 months of protection above that provided by methods through the National Family Planning Program. A total of 67% of women accept family planning when presented with the need to protect breast-feeding, usually preferring intrauterine devices or tubal ligation.

Other factors in amenorrhea

In a prospective study in Bangladesh a seasonal pattern of births was found in village women not using contraceptives (15). The highest conception rates were in the coolest months of the year. Postpartum lactational amenorrhea was very prolonged, averaging 17 months for women with a surviving child. The median waiting time to conception upon resumption of menstruation was 8 months, influenced by seasonal fluctuations in fecundability, women's ages, and the absences of their husbands. The fetal wastage rate was 15/100 conceptions, with nearly two-thirds of the fetal losses in the 1st trimester. The average birth interval was 33 months, with lactational amenorrhea accounting for approximately 45% of this interval. In a large study in rural Bangladesh, it was found that the age of the women is positively related both to the length of postpartum amenorrhea and to waiting time for conception (16). After controlling for the effect of maternal age, parity is found to be negatively related to the dura-

tion of amenorrhea, whereas nutritional variables showed no effect on the duration of postpartum amenorrhea in this study.

Malnutrition in the lactating woman may tend to lengthen the period of postpartum amenorrhea (17). If the mother's nutritional status is improved, a decrease in birth interval may follow. A good argument exists for provision of lactating women with appropriate contraceptives for their own health, the protection of their infant's health, and to prevent rises in birth rates.

In Guatemala, investigators found that improved nutritional status of poor rural women during the 3rd trimester of pregnancy is associated with a decreased duration of postpartum amenorrhea (18). In addition, food supplementation ingested by the infant during the first 9 months of life is negatively associated with the duration of amenorrhea. Analysis indicates that both supplementation programs act independently to decrease the length of postpartum amenorrhea. It can be either assumed that if the breast-fed infant's diet is supplemented, the frequency of sucking will decrease, reducing the secretion of prolactin and triggering the commencement of ovulation (19), and/or, once the breast-fed infant's diet is supplemented the nutritional demand of lactation will be reduced, hence indirectly improving the maternal nutritional status. Both hypotheses must be considered to be operative.

Although a large proportion of women in Bangladesh are undernourished, nearly every mother breast-feeds, with more than half of the women who became pregnant continuing to breast-feed into the 3rd trimester, and even 5% of women with infant deaths continuing to breast-feed another child (20). This is a strong suggestion that nutritional programs aimed at supplementing breast-feeding women and their infants be extremely carefully designed to support current patterns of breast-feeding and not to interfere. Maternal nutritional status has not been found to affect significantly the duration of postpartum infertility (21). Feeding programs for lactating mothers appear unlikely to result in increased fertility, as long as the mothers and not the infants are consuming the supplements. Feeding programs should be designed to supplement breast-feeding and *not* replace it.



Lactation and population

The relationships between lactation and postpartum amenorrhea indicate that the longer the duration of lactation, the longer the period of postpartum amenorrhea. Generally, there are an additional 9 months of amenorrhea in breast-feeding populations when compared with populations not breast-feeding at all, and this would increase the interbirth interval by approximately 50%. In the presence of poor nutrition and prolonged lactation, which are characteristics of poor societies in developing countries, there is a lengthening of the period of postpartum amenorrhea and a decrease in reproductive capacity (22). However, better nutrition appears to be associated with longer periods of lactation and, therefore, could reduce the infant mortality rates (23, 24), whereas short periods of lactation obviously occur in instances of neonatal or infant deaths (25–28).

In a review of current research relating lactation to reproduction, several authorities have concluded that lactation represents an inefficient contraceptive for the individual, but that for populations sustained lactation is associated with reduced fertility (29–31).

In a study of nursing mothers in the United States, Kippley and Kippley (32) reported that breast-feeding ranged from 4 to 37 months with a mean of 5.9 months; amenorrhea lasted an average of 10.2 months. Another study, in Egypt, found that mothers pursued full lactation for 9 months and supplemented lactation for an additional 6 months (33). The authors found a positive correlation between maternal age and the age at weaning, the older women breast-feeding longer. High parity at a young maternal age seems to result in shorter periods of lactation. In examining the return of menstruation, it was found that more than one-third of the mothers menstruated within 9 months, and by the end of 15 months, nearly 90% were menstruating. As has been documented in other studies, the shorter the duration of lactation, the earlier the resumption of menses. More than half the mothers became pregnant again during the first year while they were still lactating. Lactation was thus considered far from being a satisfactory method of birth control.

The endocrinological effects causing lactational amenorrhea are mediated through prolactin secreted from the anterior pituitary as a result of the infant's suckling the breast (34). This is called the "prolactin reflex", a somatic response to suckling the breast, responsible for milk secretion and for interruption of ovulation (35).

In describing the physiology of prolactin secretion, Tyson (19) states that the extent of the prolactin peak is proportionate to both the length of the nursing period and the intensity of the suckling stimulus. Prolactin secretion is even greater when both nipples are stimulated simultaneously. The prolactin reflex seems to be mediated by the hypothalamus by way of a neurohumoral prolactin inhibitor factor believed to be the catecholamine dopamine (36). An excess of dopamine is inhibitory, while depletion of dopamine is followed by a release of prolactin. Hypothalamic injections of prolactin enhance dopamine turnover while suckling depletes dopamine stores. The resulting burst of prolactin secretion stimulates milk production and promotes amenorrhea. These interactions will vary with the time of day and duration of breast-feeding, the frequency of suckling, and the completeness of breast emptying.

The other influences on the amenorrhea and prolongation of interbirth intervals associated with lactation include undernutrition in breast-feeding women (17), the taking of birth control pills (37), cultural factors that include abstinence from sexual intercourse until weaning (38–40), paternal age, and education (41). The combined contraceptive pills or sequential preparations have an appreciable depressive effect on milk output, whereas progestins alone do not impair lactation and milk flow may even be enhanced. Most authors agree that the effect on the birth intervals is not restricted to the duration of lactation alone, but actually to the type and completeness of breast-feeding (1, 11, 23, 42).

Contraceptives and breast-feeding

Experts on birth intervals estimate that lactational amenorrhea affords up to 33% more protection against fertility than other contraceptive methods. Because pregnancies occurring during breast-feeding are hazardous to the nursing infant, breast-feeding is a



reason for contraception, not an alternative. Since estrogen diminishes lactation, it is recommended that a regimen of estrogen-free pills, intrauterine devices, or other methods be used along with counseling expectant women on breast-feeding and contraception. The use of combined oral contraceptives should be delayed in breast-feeding women for at least 6 months postpartum, not only because estrogen will adversely affect breast milk production, but because of the possibility of hormones reaching the suckling infant (43).

There are excellent sources of current information on natural family planning including information about temperature, mucus, and cervical changes as related to fertility and breast-feeding (44, 45). The disadvantage of relying only on breast-feeding as a contraceptive is that there is no reliable means of predicting when ovulation will resume. It is recommended that women adopt contraceptives early in breast-feeding, even though for the majority birth control may be unnecessary for months. A conflict exists between the benefits for women to breast-feed as long as possible and their desires to escape the restrictions of a traditional society, to join the labor force, and to enjoy the "freedom" associated with bottle-feeding (46).

Despite reports that breast-feeding is associated with prolonged amenorrhea, some lactating women menstruate as soon after pregnancy as nonnurses (47). Ovulation is suppressed during amenorrhea, but it can precede the first postpartum menstrual cycle by 2 wk. The return of menstruation is accepted as indicating regained fertility, but actually menses do not necessarily mean that ovulation has occurred. If fertilization occurs, menstrual flow is again postponed and postpartum amenorrhea becomes the amenorrhea of pregnancy. In the minority of women ovulation precedes the first menstrual flow. On the average, two anovulatory cycles follow the resumption of menstruation. Since breast-feeding prolongs the birth interval, it may provide better protection as a contraceptive than ineffective contraceptive methods for a period of about 10 months. At all times, however, breast-feeding is considered less reliable than other methods.

A review (48) of fertility regulation during human lactation in Bangladesh, the Philip-

pinas, Indonesia, and Nigeria, describes the maintenance of relatively prolonged birth spacing through the traditional fertility control measures of lactational amenorrhea and abstinence in the postpartum period. The authors emphasize that one of the major goals of health programs in the developing world is to improve maternal and child health, with the two significant influences on achievement of the goal being the promotion of birth spacing and the promotion of breast-feeding. Because spacing requires some type of fertility control, modern contraceptive programs are becoming integral parts of maternal and child health delivery systems. It is recommended that in traditional societies, birth spacing in lactating women would best be accomplished with the support of the traditional practices for as long as possible. In those societies where abstinence is practiced, the time to change to a modern contraceptive technique could easily be identified. Where lactational amenorrhea is the controlling factor, the problem becomes more complex. If one waits until the first menstrual cycle appears, a certain number of women will have become pregnant before that event. The availability of abortion could manage this problem and may be acceptable in those societies that recognize the adverse effects of short birth intervals. It is proposed that if a program of contraceptive overlap is recommended, it should be adapted to the social and cultural situations so that the method chosen has a reasonable chance of extending beyond the period of postpartum amenorrhea.

Child survival and birth intervals

Just as birth spacing affects an infant's health, survival of the infant influences birth intervals. In the Punjab, the average birth interval is up to a year longer when the infant lives, as compared with instances when the child is either stillborn or dies neonatally (49). Retrospective data from 1500 couples confirmed that lactation substantially prolonged postpartum amenorrhea. When the infant survived, lactation lasted well over 1 yr, and the median length of amenorrhea was 11 months. However, with a stillborn child or one who died neonatally, the mother did not lactate and the length of postpartum amenorrhea averaged 2 months. German data on



breast-feeding in the late 19th and early 20th centuries were explored for causal relationships among breast-feeding, fertility, and infant mortality (2, 3). Fertility was strongly influenced by the duration of breast-feeding and although not conclusive, the fertility patterns may be partially explained by variations in infant mortality.

The child survivorship hypothesis states that improved child survival rates will contribute to increased family motivation for family planning (50). Child survivorship has these effects mainly in countries with declining infant mortality. This relationship is questioned by some who suggest that survivorship is not a necessary precondition for a decline in fertility (51). It cannot be demonstrated that parents reflexively respond to each loss by replacing the dead child, nor that parents respond to high mortality rates by having more children than may ultimately be desired. But there are data that document a positive association between child and infant mortality and later fertility.

The death of a child shortens birth intervals, partly because of the absence of postpartum amenorrhea with lactation. Parents tend to replace children who have died. This may provide the basis for program development with an emphasis on enhancing the conscious awareness of better child survival through the combination of child care and family planning programs.

In a study of Pakistani and Bangladeshi women, more than 8000 pregnancy histories were reviewed and the time measured between successive live births (52). Data show that women whose children have died have a shorter interval between births than those women whose children survive. If data are not included where the infant death prevented breast-feeding, however, the birth interval differences are insignificant. Advocating the reduction of child mortality as part of the effort to control population is questioned, since the effect of this biological reduction of fertility is minimal and reduced mortality will increase survivorship and result in a net population gain. The hypothesis that population control cannot be successful until mortality rates have been lowered also is questioned since the reduction of fertility associated with mortality decline may not be due to a conscious effort.

In West Africa, high infant and child mortality corresponds to high fertility rates as influenced by three factors: 1) desire to replace the dead child; 2) death of the first child resulting in termination of lactation and renewed ovulation; and, 3) subsequent pregnancy after a short interval necessitating early weaning (53). Early weaning can be fatal, as documented by the derivation of the term "kwashiorkor", the malnutrition of a child displaced from the breast by a subsequent pregnancy.

Other factors and birth intervals

In addition to lactation and the infant's survival, the woman's age and temporary separations between the spouses have a bearing on the pregnancy interval. In Taiwan, women not using contraception required 16 months to conceive after a preceding birth (54). If the preceding pregnancy ended in a live birth and the infant survived for at least 1 yr, the women took 17 months to conceive. After age 27 yr, this interval increased by an additional month for every 2 yr of increased maternal age. If the infant died within a year after birth, the length of the following interval was shortened by approximately 6 months, and if the preceding pregnancy ended in abortion or miscarriage the interval was considerably shorter. After a live birth, the pregnancy interval is longer for mothers under age 20 than for those in the 20- to 24-yr-old group, presumably related to lower fecundability.

The mother's health and nutritional status have definite effects on her ability to produce a live infant and on her ability to lactate. Adolescents and older women are at high risk for problems during both pregnancy and lactation (55). Special attention must be paid to the nutritional status of adolescents and to effective ways of delaying the age of first pregnancy. Pregnancy at advanced age is hazardous, making special protection necessary for women at the upper end of the childbearing years or of high parity. Infant mortality shortens lactation, removes cultural pressures for abstinence, and places women in a continuous state of reproductive effort. The concept of protecting the pregnancy-free interval tends to disappear with fetal or neonatal death.

The well-nourished woman, not depleted



by repeated cycles of pregnancy and lactation, or pregnancy during adolescence, will be physiologically able to breast-feed adequately for a long period. Although caloric requirements for lactation vary with the infant's demand, an additional 400 to 500 cal, and 20 g of protein are required daily for the woman to supplement her regular diet (Zanarty J, Tyson JE. Unpublished data). The frequency, duration, and intensity of suckling are the most important factors in the maintenance of lactation (56). When malnourished women are given vitamin and iron supplements there follows an increased milk production without loss of maternal body weight.

For effective child spacing a plea is made for traditional breast-feeding with suckling promoted throughout the 24-h each day and with other foods not offered before 4 to 6 months (4). Women are considered to have a biological method of child spacing through the hormonal effects of lactation (57). Further investigation is needed for an economical long-acting contraceptive which will not be harmful to lactation or to the infant and which may even enhance milk production.

Some authorities question whether improved nutrition and health will increase the acceptability and practice of family planning (58). A woman's nutritional and health status definitely influences her reproductive capacity, the outcome of pregnancy, and her lactation performance (59). Breast-feeding plays a role not only in birth spacing, but also in the infant's health and survival. It has been argued that a nutritionally adequate food supply is essential for the success of family planning programs (60, 61).

The "natural" birth interval which permits physiological recovery is shortened by artificial feedings and the dissolution of taboos against postpartum sexual intercourse. A birth interval less than 2.5 yr may have serious physiological implications for women living at or below the poverty level. Better nutrition before and during pregnancy, along with antenatal health services, is vital for normal gestation and lactation. Programs should focus on the importance of breast-feeding and provision of the necessary support for women and their nursing infants. Appropriate contraceptive measures should also be emphasized during the postpartum and preweaning period.

In certain parts of the world malnutrition is chronic and persistent from one generation to the next. In Central America, data were analyzed to examine the relationships among birth spacing, maternal nutritional status, and past fertility history in an area with high rates of illiteracy and malnutrition (62). Risks attributed to maternal immaturity are exaggerated by nutritional deprivation during the mother's own childhood and adolescence. Maternal age of 16 yr was the borderline below which favorable outcome of pregnancy was unlikely. A succession of closely spaced pregnancies further increases this risk burden (63). Increasing parity has its greatest detrimental effect when combined with maternal malnutrition. Programs should aim at improving adolescent nutrition, delaying the first pregnancy, widening birth intervals, lowering parity, and encouraging both lactation and family planning.

Nutrition and lactation

In considering the nutritional requirements of lactation one must clearly distinguish between the terms "lactation," which is a physiological phenomenon, and "breast-feeding," which is an aspect of behavior (64).

All authorities have agreed that the energy requirements of lactation are proportionate to the quantity of milk produced (65). Human milk has approximately 70 cal/100 ml and there is an 80% efficiency of converting maternal energy into milk (29). Therefore, approximately 90 cal are required to produce 100 ml of milk. If one estimates that 850 ml are produced daily on the average, a nursing mother will use approximately 800 cal for milk production.

During pregnancy, approximately 2 to 4 kg of body fat are stored if the pregnant woman follows the recommendation of adding 350 cal to her daily dietary intake (66). This body fat can be mobilized to provide between 200 to 300 cal each day for approximately 3 months during the early stages of lactation. In women who will not lactate, this storage is of little benefit and is considered an etiologic factor in obesity (67).

A daily milk production of 850 ml would contain approximately 10 g of protein; a maximum production of 1200 ml of breast milk would account for 15 g of protein. With an



efficiency of 70% in the conversion of dietary protein to milk protein, the FAO/WHO Expert Group advises that 20 g of protein be added to the lactating woman's diet (66).

According to some nutritional authorities, even an undernourished mother is able to secrete as much breast milk as a well-nourished mother for periods extending up to 2 yr, but she does this at a cost to her own health (68, 69). In certain studies, it has been documented that Indian women who are lactating, lose between 1.8 and 7.3 kg over a period of 1 yr (70, 71). This has also been confirmed by the losses due to breast-feeding in women participating in Project Poshak (72).

It has been found that the use of the IUD seems to stimulate lactation (73). A possible explanation for this is that the IUD's mechanical action provokes a neuroendocrine reflex that increases the secretion of endogenous oxytocin.

A WHO Expert Committee on Nutrition emphasized that estimates of the nutritional costs of pregnancy and lactation cannot be transposed from one area of the world to another where different conditions exist (64). In general, the reported nutrient intakes of pregnant and lactating women are higher in affluent than in poor countries. Diets in developed countries are likely to be deficient only in calcium and possibly in iron, but diets in most developing countries are likely to also be low in vitamin A, the B vitamins, and ascorbic acid, as well as total calories and proteins.

A PAHO Expert Working Group concluded in 1970 that the nutrition of pregnant and lactating women in Latin America and the Caribbean is seriously defective and causes poor health in mothers and poor growth and development, as well as high mortality rates in their infants (74). Those mothers unable to plan and limit the size of their families contribute disproportionately to the morbidity and mortality statistics. This group of experts believed that there was ample evidence to document that rapid succession of cycles of pregnancy and lactation can seriously affect both the mother and her future offspring and that families with large numbers of children have the problem of obtaining adequate amounts of food for their nourishment. After the desired number of

children is reached, limitation of family size is important to protect both the mother and her family. 

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