

Breast-feeding and child-spacing: importance of information collection for public health policy

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The presence of lactational amenorrhoea cannot be fully relied upon to protect the individual mother against becoming pregnant. Nevertheless, the use of breast-feeding as a birth-spacing mechanism has important implications for global health policy. This article identifies the information that should be collected and examined as a basis for developing guidelines on how to reduce the dual protection afforded by postpartum lactational amenorrhoea and other family planning methods, and discusses when such methods should be introduced.

Introduction

Many women have little or no access to modern contraceptive techniques and consequently they make little use of family planning methods of fertility regulation. Thus, in cultures where frequent and prolonged breast-feeding is common, postpartum amenorrhoea and suppressed ovulation are frequently the principal mechanisms that ensure adequately spaced pregnancies. Indeed, in many developing countries, more births are still averted this way than by any other single family planning method.

Although for the individual mother, lactational amenorrhoea does not provide completely reliable protection against pregnancy, the effectiveness of breast-feeding as a birth-spacing mechanism has important global health policy implications. An increased understanding of the reasons for the considerable differences in the duration of lactational amenorrhoea between communities and individuals, and of the factors that control lactational infertility, should facilitate development of guidelines for use by health planners and health-care administrators in maximizing the contraceptive effect of breast-feeding. Practical guidance about when mothers should adopt artificial contraceptive methods and how to prevent the adverse effects of some hormonal contraceptives on lactation are particularly important.

To contribute to improved understanding of the effectiveness of lactation as a contraceptive method and its relation to child-spacing, the WHO Breast-feeding Data Bank collects and analyses information

on breast-feeding and its effect on fertility regulation.⁴ This article first describes the methods used to assess lactational infertility and how the information obtained is incorporated into the data bank. Relevant information gathered from published sources and from studies commissioned by WHO since 1983 is then summarized. Finally, practical health policy implications that are associated with lactation-associated infertility are briefly discussed.

Birth interval, fertility, and lactational amenorrhoea

Numerous studies indicate that breast-feeding lengthens the interval between pregnancies and thus decreases natural fertility (Fig. 1) (1). In turn, longer intervals between births significantly enhance infant survival and reduce maternal morbidity and mortality, especially in developing countries (2-3).

In populations where the prevalence of family planning methods is low, birth intervals are largely determined by the frequency and duration of breast-feeding. Where breast-feeding is both frequent and prolonged, birth intervals are increased by an estimated 15-32%. Studies in rural areas of India (Punjab) and China (Province of Taiwan) indicate that birth or pregnancy intervals for women who breast-fed for an average of 1-2 years, and who used no other form of contraception, were 5-10 months longer than those who miscarried or whose infants died shortly after birth (4-5).

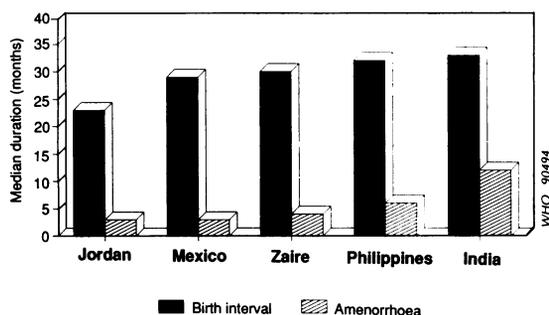
Studies among Inuits in Alaska (6) and Indians in Punjab show that rates of conception for women who did not use family planning methods, but who continued to breast-feed, remained low for nearly one

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Fig. 1. Illustration of the relationship between the duration of lactational amenorrhoea and birth interval.



year postpartum. Of the Indian women who breast-fed for 7 months or longer, 98% had not conceived by the end of the sixth month; however, the cumulative rate of conception increased to 13% after one year and continued to rise rapidly thereafter, even though the women in question were still breast-feeding at the time of conception (7).

Breast-feeding alone is not always responsible for increasing birth intervals. For example, man-

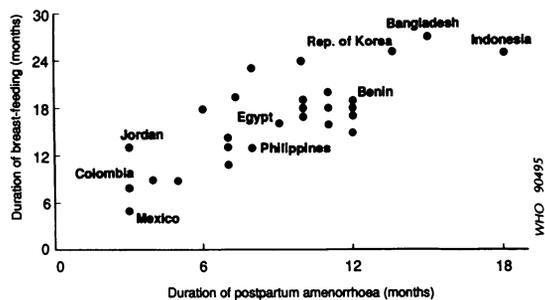
datory sexual abstinence during, or even beyond, the normal period of lactation in some traditional societies (e.g., among the Yoruba in Nigeria) can also play an important role. Although this practice is gradually being eroded, it remains important enough to warrant careful consideration in any study of the relation between breast-feeding practices and fertility.

The duration of lactational amenorrhoea, which varies from 2 months to 20 months, has the greatest impact on differences in birth intervals, and is another method of assessing lactational infertility (8-9). Based on the results of a number of studies that have attempted to establish a relation between lactation and postpartum amenorrhoea (see Table 1), the median duration of amenorrhoea following child-birth appears to be about 7-10 weeks in the absence of lactation. In contrast, the average duration of amenorrhoea among lactating women can be up to 2 years (Table 1 and Fig. 2). The extent to which fertility is reduced during the months prior to, and immediately following, resumption of menstruation can thus be determined and analysed by collecting data, by month postpartum, on the proportion of mothers who are menstruating.

Table 1: Median duration of breast-feeding and postpartum amenorrhoea in selected countries

Country	Period	Sample size	Median duration (in months) of:	
			Breast-feeding	Postpartum amenorrhoea
Mexico	1985-86	1131	5.0	3.0
Colombia	1988	702	8.0	3.0
Jordan	1978	769	13.0	3.0
Zaire	1987-88	1102	9.0	4.0
Fiji	1981-84	2660	9.0	5.0
Thailand	1984	—	18.0	6.0
Yemen	1981-84	2216	11.0	7.0
Syrian Arab Republic	1981-84	4025	11.0	7.0
Turkey	1975	515	13.0	7.0
Tunisia	1981-84	3021	14.0	7.0
Botswana	1984	3064	19.5	7.3
Philippines	1981-84	6667	13.0	8.0
Sri Lanka	1986-87	1350	23.0	8.0
Mauritania	1981-84	2447	16.0	9.0
Egypt	1981-84	5667	16.0	9.0
Kenya	1981-84	5679	17.0	10.0
Cote d'Ivoire	1981-84	3804	18.0	10.0
Lesotho	1981-84	2348	19.0	10.0
Indonesia	1982	1254	24.0	10.0
Sudan	1981-84	2242	16.0	11.0
China (Province of Taiwan)	1972	1516	18.0	11.0
India	1982	428	20.0	11.0
Haiti	1981-84	1489	15.0	12.0
Pakistan	1986	1098	17.0	12.0
Ghana	1981-84	3335	18.0	12.0
Cameroon	1981-84	4650	18.0	12.0
Benin	1981-84	2803	19.0	12.0
Republic of Korea	1973	746	25.2	13.6
Bangladesh	1981-84	3836	27.0	15.0
Nepal	1976	5954	25.0	18.0

Fig. 2. Illustration of the relationship between the duration of breast-feeding and that of postpartum amenorrhoea.



The return of menstruation and fertility occur much more rapidly among women in industrialized countries than among those from poor segments of populations in developing countries (Table 2) (10, 11). This may be due to differences in breast-feeding practices, since full or exclusive breast-feeding is

more closely associated with longer periods of lactational amenorrhoea and infertility than is partial or supplemented breast-feeding.

It is very important to make a distinction between full and partial breast-feeding. Women who are partially breast-feeding are at higher risk of conceiving than women who are fully breast-feeding. The consensus statement on the use of breast-feeding as a family planning method made by participants at the Bellagio Consensus Conference on Lactational Infertility in 1988 affirmed that the maximum birth-spacing effect of breast-feeding is achieved when a mother "fully" or "nearly fully" breast-feeds and remains amenorrhoeic (12). When these two conditions are fulfilled, breast-feeding provides more than 98% protection from becoming pregnant in the first 6 months postpartum. The data in Table 1 need to be analysed in this light. Thus since in Jordan, for example, the median duration of postpartum amenorrhoea is only 3 months, but the median duration of breast-feeding is 13 months, the vast majority of these women must be introducing feeding supplements to

Table 2: Percentage of mothers who had begun menstruating, by age of the child, and whether or not it was breast-fed^a

Country	Group ^c	Percentage of mothers, with child aged: ^b					
		3-4 months		7-8 months		11-12 months	
		BF	NBF	BF	NBF	BF	NBF
Ethiopia	A	56	94	—	100	—	—
	C	32	—	31	90	38	83
	R	8	—	9	—	16	—
Nigeria	A	52	—	58	82	—	—
	B	32	—	54	91	50	90
	C	7	—	29	—	25	—
Zaire	R	7	—	28	—	39	—
	A	26	—	46	—	64	—
	C	25	—	32	—	44	—
Chile	R	4	—	20	—	39	—
	A	23	85	—	98	—	98
	C	53	100	64	96	69	97
Guatemala	R	26	80	71	100	56	97
	A	40	96	—	99	—	98
	C	35	94	43	100	50	94
India	R	11	—	17	—	50	100
	A	56	84	74	97	86	100
	B	33	80	62	100	85	97
Philippines	C	17	—	25	—	33	—
	R	1	—	12	—	20	—
	A	21	98	—	100	—	100
Hungary	C	28	94	44	91	69	88
	R	23	87	41	94	69	95
	All	52	93	63	98	79	99
Sweden	All	17	93	42	97	—	—

^a Source: *Contemporary patterns of breast-feeding: report on the WHO Collaborative Study on Breast-feeding*. Geneva, World Health Organization, 1981.

^b BF = breast-fed; NBF = not breast-fed.

^c A = urban, economically advantaged; B = urban, middle income; C = urban poor; R = rural.

their children at a very early age. Without information on the quality of breast-feeding (whether it is full or partial), such data are of limited value. There is essentially no difference in the contraceptive effect of breast-feeding between industrialized and developing countries when completeness of breast-feeding is taken into account.

Several studies have reported a link between use of dietary supplements and shortened periods of postpartum amenorrhoea, which is presumed to result from a reduction in the vigour and frequency of sucking associated with the introduction of other foods. Information on the proportion of infants receiving supplements, by month postpartum, has therefore also been included in the WHO Breast-feeding Data Bank.

Breast-feeding patterns (e.g., scheduled versus on-demand feeding, and the prevalence and duration of night feeds) and practices related to the type of complementary foods and when they are introduced, all have an impact on the duration of postpartum amenorrhoea. On the other hand, some evidence suggests that when frequent breast-feeding is maintained the introduction of complementary foods, particularly after feeding at the breast, has little effect on the resumption of menstruation and return of fertility.

For breast-feeding to serve optimally as a means of prolonging intervals between pregnancies, full, on-demand breast-feeding is recommended for 4–6 months. The introduction of complementary foods should be delayed as long as possible, but a child's health or growth should not be jeopardized to achieve this (13).

Return of menstruation is frequently used as a convenient indirect indicator of resumed ovulation, especially in studies of large populations. Consensus reached at the 1988 Bellagio Conference defined the return of menses as the first vaginal bleeding after the fifty-sixth day postpartum (13), although this need not be similar to the woman's menstrual episodes before the pregnancy.

There is a direct relation between lactational amenorrhoea and the duration of lactational infertility. Fertility is substantially reduced during the period of lactational amenorrhoea—only 2–10% of breast-feeding mothers conceive before resuming postpartum menstruation. The risk that an amenorrhoeic lactating woman conceives is related to the time elapsed since delivery. Breast-feeding women who resume menstruating within 6 months of child-birth usually do so before their first postpartum ovulation, whereas those who remain amenorrhoeic for longer than 6 months are most likely to ovulate before their first menstruation. Thus the return of

menstruation can be used as an indicator of when to begin using other methods of contraception only during the early postpartum period. Information on variations in the duration of amenorrhoea in rural and urban areas of selected industrialized and developing countries, showing the proportions of women who began breast-feeding and for how long, and when they resumed their menses at specified intervals after birth, could be useful for identifying those women who are at risk of becoming pregnant and for understanding better the relation between lactation and amenorrhoea. Assessment of the duration of lactational infertility can also be based on the detection of ovulation. Various investigations have attempted to define the timing of ovulation after childbirth using endometrial biopsy and by studying the basal body temperature, cervical mucus, or vaginal cytology as indirect markers of ovulation. Other studies have used more direct indices such as estimations of hormone levels in blood, saliva, or urine, or ultrasonic scans of the ovaries in combination with endocrine measurements. The frequency of ovulation in the cycle before the end of lactational amenorrhoea varies from 14% to 75%, which may be partly due to different suckling patterns. As discussed above, the longer the first menses are delayed during lactation, the more likely the first cycle will be ovulatory (14–17). Nevertheless, the duration of lactation has a marked impact on the onset of ovulation; the longer lactation continues, the longer the anovulatory period (18).

In general, after the sixth month postpartum, there is an increased likelihood that fertility precedes the first vaginal bleeding and initiation of complementary feeding (13). At this stage the protection against another pregnancy provided by lactational infertility falls below that afforded by other contraceptive methods.

Other factors that influence lactational infertility and breast-feeding behaviour

Age and parity have long been regarded as important factors that influence lactational infertility and breast-feeding behaviour, since the period of lactational amenorrhoea tends to be longer for older and multiparous than for younger and primiparous women. The two factors are nearly always strongly correlated; "age of mother" has therefore been included in the WHO Breast-feeding Data Bank in order to test this relation.

Other possible factors that affect lactational infertility, e.g., maternal nutritional status, are independent of the frequency and duration of breast-feeding. Except in extreme cases of deprivation and famine, malnutrition has only a minor impact on the

quality and quantity of breast milk.^b It has been suggested that the return of menstruation during lactation may be delayed in undernourished women. Results from India suggest that, among women of the same socioeconomic status who have similar breast-feeding patterns, lactational amenorrhoea is longer for those of low body weight for any given duration of lactation (19, 20). Studies in the Gambia on the effects of food supplements given to lactating women showed that, even though supplementation did not influence the quantity of milk, there was a significant drop in plasma prolactin levels and a more rapid return of menstruation (21, 22). It is difficult, however, to draw definite conclusions from these results because of the potential effects of important confounding factors such as differences in socioeconomic status, working conditions, breast-feeding practices, and the quality and number of health and nutrition interventions.

As mentioned previously, the type and timing of complementary feeding has an important impact on suckling behaviour, and is generally associated with the following: a reduction in the number, intensity and duration of suckling episodes, resulting in a relaxation of the neural inhibition of the hypothalamus; a decline in plasma prolactin levels; and, inevitably, an earlier return of ovulation and menstruation. It has been proposed that if additional foods are introduced into the baby's diet gradually and over an extended period of time while breast-feeding is continued, the latter may still exert a significant antifertility effect for one year or longer; the main point is that breast-feeding should not be reduced and other foods should not replace breast-feeding (12).

Duration of breast-feeding and prevalence of contraception

The duration of breast-feeding accounts for 96% of the variation in the length of time of postpartum amenorrhoea. Lactation has its greatest impact on postpartum amenorrhoea when breast-feeding is continued for 6 to 18 months (2).

Several epidemiological studies have documented the prevalence and duration of breast-feeding, which is usually shorter among young, affluent, urban, educated women than among their older, poorer, rural, and less-educated counterparts (10). A decline in the prevalence and duration of breast-feeding has been reported in several countries in Asia

and Latin America, although in Malaysia, Singapore, and Thailand the situation appears to be stabilizing (23, 24).

In developing countries any reduction in the present high incidence, frequency, and duration of breast-feeding is likely to increase fertility, especially if the use of other family planning methods fails to increase correspondingly. In developing countries where contraceptive use is less than 10% and the fertility rate is high, as was the case in, for example, Bangladesh in the late 1970s (25, 26), any substantial decline in breast-feeding would require a more than fivefold increase in contraceptive use to prevent the already high fertility rates from rising further. The situation in Kenya is also illustrative; declines in the duration of breast-feeding and of postpartum abstinence, combined with infrequent use of artificial methods of contraception, have resulted in one of the world's highest population growth rates. Currently, the population is doubling approximately every 17 years.

Health policy implications

The interplay between lactational infertility and contraceptive practice needs to be considered before their ultimate combined effect on fertility can be determined. The effect of breast-feeding on fertility control and child-spacing has to be considered in the context of all the other factors that are relevant both to a particular population and to individuals.

Every effort should be made to gather and analyse complete information on all the factors that affect breast-feeding behaviour and lactational infertility: the mother's age, the median duration of breast-feeding and of postpartum amenorrhoea, the length of birth intervals, the prevalence of contraceptive use, the proportion of women menstruating (by month postpartum), and the proportion of infants given complementary foods (by age). Such information could improve understanding about how breast-feeding influences fertility and facilitate the preparation of policy guidelines on breast-feeding and child-spacing. It would be particularly useful, for example, to analyse the interaction between the age and the proportion of lactating women who have the greatest risk of conception by month postpartum, based on data on the median duration of breast-feeding and postpartum amenorrhoea for a given community or group.^c

It is not sufficient to demonstrate a direct relation

^b An annotated bibliography of the effect of maternal nutritional status on the duration of lactation. Unpublished WHO (Nutrition Unit) listing, 1988.

^c Breast-feeding and fertility: a simplified methodology for community-based calculation of the proportion of mothers at risk of conception by breast-feeding status. Unpublished WHO document MCH/85.15/Rev.87.

between breast-feeding and lactational infertility and hence child-spacing, since it is also important to determine when to introduce other family planning methods and how to minimize the incidence of the "dual coverage" provided by lactational amenorrhoea and other contraceptive measures. By delaying the introduction of such measures, the extent of overlap between the two is reduced and the contraceptive benefit of exclusive breast-feeding is increased. On the other hand, if other contraceptive measures are introduced too late, there is an increased risk of unwanted pregnancy with all that this implies for the health and nutritional status of mothers and children alike.

Breast-feeding has an important untapped potential as a natural family planning method because of its effect on child-spacing. This is particularly true for mothers who lack access to artificial family planning methods or who are dissatisfied with their inconvenience or potential side-effects. Guidelines are therefore needed on the most appropriate timing of the introduction of other family planning methods in specific environments, based on prevailing breast-feeding patterns and the duration of lactational amenorrhoea.

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Résumé

Allaitement maternel et espacement des naissances: du recueil de l'information à la politique de santé publique

L'aménorrhée liée à la lactation ne doit pas être considérée au niveau individuel comme une garantie contre une autre grossesse. Néanmoins, l'allaitement au sein en tant que mécanisme d'espacement des naissances a d'importantes implications dans une politique globale de santé. Cet article examine l'information qu'il faut recueillir et analyser pour élaborer des directives pertinentes, en particulier celles qui indiquent comment réduire la double couverture apportée par l'aménorrhée du post-partum et la contraception artificielle, et quand introduire la seconde.

Cet article décrit les méthodes utilisées pour évaluer l'infécondité liée à la lactation et analyse les données disponibles sur l'allaitement maternel et sur la régulation de la fécondité.

De nombreuses études ont montré que l'allaitement maternel prolonge l'intervalle entre les grossesses et réduit en conséquence la fécondité naturelle. L'allongement de l'intervalle entre les naissances va de pair avec l'augmentation des chances de survie de l'enfant et la réduction de la morbidité et de la mortalité maternelles, spécialement dans les pays en développement.

La durée de l'aménorrhée liée à la lactation, principal facteur responsable des différences dans les intervalles entre les naissances puisqu'elle peut être de 2 à 20 mois, représente un autre moyen d'apprécier l'infécondité liée à la lactation. Calculée à partir d'un certain nombre d'études ayant essayé d'établir la relation entre la lactation et l'aménorrhée du post-partum, la durée médiane de l'aménorrhée qui suit l'accouchement semble être de 7 à 10 semaines en l'absence de lactation. En revanche, sa durée moyenne chez les femmes allaitantes peut aller jusqu'à deux ans. La mesure dans laquelle la fertilité est diminuée durant les mois précédant ou suivant immédiatement le retour des règles peut donc être ainsi déterminée et analysée en recueillant les données sur la proportion de mères ayant leurs règles par mois du post-partum.

Pour que l'allaitement maternel puisse servir au mieux de moyen de prolonger l'intervalle entre les naissances, il doit être exclusif et donné à la demande pendant les 4 à 6 premiers mois. L'introduction d'aliments de complément doit être retardée aussi longtemps que possible, sans compromettre pour autant la santé ou la croissance de l'enfant.

Le retour des règles est fréquemment utilisé comme indicateur indirect de la reprise de l'ovulation, spécialement dans les enquêtes sur de larges populations. Le consensus adopté lors de la conférence de Bellagio en 1988 définit le retour des règles comme le premier saignement vaginal après le cinquante-sixième jour du post-partum, même s'il n'est pas nécessairement identique aux saignements menstruels de la femme avant la grossesse.

La durée de l'allaitement maternel explique 98% des variations de la durée de l'aménorrhée du post-partum. La lactation a le plus d'impact sur l'aménorrhée quand la durée de l'allaitement se situe entre 6 et 18 mois. Plusieurs enquêtes épidémiologiques ont documenté la prévalence et la durée de l'allaitement. Cette durée est habituellement plus courte chez les femmes jeunes, ayant fait des études et de milieux aisés urbains que chez les femmes plus âgées, pauvres et sans instruction des zones rurales. Un déclin de la durée et de la prévalence de l'allaitement maternel

a été constaté dans plusieurs pays d'Asie et d'Amérique latine, alors que dans quelques rares pays la situation semble se stabiliser.

L'allaitement maternel représente un potentiel non exploité en tant que méthode naturelle de planification familiale grâce à son rôle dans l'espacement des naissances. Ceci est particulièrement vrai pour les mères qui ont peu accès à la contraception artificielle ou qui ne sont pas satisfaites du fait des inconvénients et des effets secondaires possibles de la méthode. Des directives sont donc nécessaires sur le moment le plus approprié pour l'introduction d'autres méthodes de planification familiale dans des environnements spécifiques, en se basant sur les modes d'allaitement maternel et la durée de l'aménorrhée liée à la lactation qui y prévalent.

References

1. **van Ginneken, J.K.** The impact of prolonged breast-feeding on birth intervals and on postpartum amenorrhoea. In: Mosley, W.H., ed. *Nutrition and human reproduction*. New York, Plenum Press, 1978, pp. 179-195.
2. **Thapa, S. et al.** Breast-feeding, birth-spacing and their effects on child survival. *Nature*, **335**: 679-682 (1988).
3. **Short, R.** Breast-feeding. *Scientific American*, **250**(4): 35-41 (1984).
4. **Jain, A.K.** Pregnancy outcome and the time required for next conception. *Population studies*, **23**: 421-433 (1969).
5. **Potter, R.G. et al.** Applications of field studies to research on the physiology of human reproduction: lactation and its effects upon birth intervals in eleven Punjab villages, India. In: Sheps, M. & Ridley, J., ed. *Public health and population change*. Pittsburgh, University of Pittsburgh Press, 1965, pp. 377-399.
6. **Berman, M. et al.** Effect of breast-feeding on postpartum menstruation, ovulation and pregnancy in Alaskan Eskimos. *American journal of obstetrics and gynecology*, **114**: 524-534 (1972).
7. **van Ginneken, J.K.** Prolonged breast-feeding as a birth-spacing method. *Studies in family planning*, **5**: 201-206 (1974).
8. **Huffman, S.** Maternal and child nutritional status: its association with the risk of pregnancy. *Social science and medicine*, **17**: 1529-1540 (1983).
9. **Jelliffe, D. & Jelliffe, P.** Lactation amenorrhoea: an important present-day component of family planning programmes. *Journal of tropical pediatrics*, **31**: 240-241 (1985).
10. *Contemporary patterns of breast-feeding: report on the WHO Collaborative Study on Breast-feeding*. Geneva, World Health Organization, 1981.
11. Breast-feeding, fertility and family planning. *Population reports: series J*, **24**: 525-591 (1981).
12. **Kennedy, K. et al.** Consensus statement on the use of breast-feeding as a family planning method. *Contraception*, **39**: 477-496 (1989).
13. Consensus statement. Breast-feeding as a family planning method. *Lancet*, **2**: 1204-1205 (1988).
14. **Perez, A. et al.** Timing and sequence of resuming ovulation and menstruation after childbirth. *Population studies*, **25**: 491-503 (1971).
15. **Howle, P.W. et al.** Fertility after childbirth: effect of breast-feeding on ovulation and menstruation. *British medical journal*, **283**: 757-759 (1981).
16. **Howle, P.W. & McNelly, A.** Effect of breast-feeding patterns on human birth intervals. *Journal of reproduction and fertility*, **65**: 545-557 (1982).
17. **Jain, A. & Bongaarts, J.** Breast-feeding patterns, correlates and fertility effects. *Studies on family planning*, **12**(3): 79-99 (1981).
18. **Perez, A. et al.** First ovulation after childbirth: the effect of breast-feeding. *American journal of obstetrics and gynecology*, **14**: 1041-1047 (1972).
19. **Prema, K. et al.** Nutrition fertility interactions in lactating women of low income groups. *British journal of nutrition*, **45**: 461-467 (1981).
20. **Bongaarts, J.** Does malnutrition affect fecundity? A summary of evidence. *Science*, **208**: 564-569 (1980).
21. **Lunn, P.G. et al.** Influence of maternal diet on plasma-prolactin levels during lactation. *Lancet*, **1**: 623-625 (1980).
22. **Lunn, P.G. et al.** Maternal nutrition and lactational amenorrhoea. *Lancet*, **1**: 1428-1429 (1981).
23. **World Health Organization.** The prevalence and duration of breast-feeding: a critical review of available information. *World health statistics quarterly*, **35**: 92-116 (1982).
24. **World Health Organization.** The prevalence and duration of breast-feeding: updated information, 1980-89. Part I. *Weekly epidemiological record*, **64**(42): 321-324 (1989). Part II. *Weekly epidemiological record*, **64**(43): 331-335 (1989).
25. **Leestaeghe, P. et al.** Compensating changes in intermediate fertility variables and the onset of marital fertility transition. (International Union for the Scientific Study of Population). In: *Proceedings of the International Population Conference, Manila, 1981*, pp. 71-95.
26. **Bongaarts, J.** The fertility-inhibiting effects of the intermediate fertility variables. *Studies in family planning*, **13**(6/7): 179-189 (1982).