

# Analysis of Factors Involved in Lactational Amenorrhea

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## Abstract

Although most studies show that breastfeeding delays the resumption of ovarian cyclicity and menses, Lactational Amenorrhea (LA) is its highly variable among different populations. Research has shown differences hormonal levels between fully nursing amenorrheic women and who those who recovered menses during the first six postpartum months: E2 levels or PRL/E2 ratio could be predictive of this condition. However, research about this phenomenon is not conclusive. Thus, this review article, through an analysis of secondary, summarizes the main factors involved in LA, considering its importance as a effective and natural contraception method.

**Keywords:** Lactational amenorrhea; Breastfeeding; Cyclicity; Fertility; Lactational amenorrhea method

## Introduction

Breastfeeding provides a natural source of nutrients for the infant and determines a period of Lactational Amenorrhea (LA) as a normal postpartum physiological phenomenon. Universally, it is now recognized that breastfeeding suppresses ovarian cyclicity and provides LA condition accompanied by a period of postpartum infertility. The duration of the LA period varies among different women and populations [1-4]. Gynecological research has found that around 50% of the women are fully nursing and cycling before 6 months postpartum [5,6] meanwhile, among other populations, LA lasts up 4 years [2,3,7,8]. These differences are not fully explained due to they occur even among women who are fully nursing with similar frequencies of suction and infant growth rates.

Most of the researches prove that breastfeeding (shown in exclusion of other feeding methods) delays the resumption of ovarian cyclicity and menses. However, a notable feature of LA is its highly and variable duration among different populations and even among homogeneous groups with comparable nursing practices [9-12] showed that, in urban populations, about 29.5% of fully nursing women had their first menses before the sixth postpartum month, even though they were exclusively breastfeeding.

Researches [11,13-18] showed that differences in the endocrine levels between nursing amenorrheic women who recovered menses during the first six months postpartum and women who remained amenorrheic for a longer period. In fact, these cases showed higher basal prolactin (PRL) concentrations due to continuous suckling stimulation than those women who returned to cyclicity earlier. Furthermore,

other studies [19,20] showed differences in the post-suckling PRL:E2 ratio at the three months postpartum between women who experience amenorrhea beyond six months and women who recovered ovarian function before six months postpartum. These results define two different endocrine profiles developed by women who have comparable nursing patterns. Also, these profiles are related to different risks of reinitiating ovarian function during breastfeeding.

## Material and Methods

This review article uses literature review of secondary sources to define the main factors involved in Lactational Amenorrhea. Although, this information is mostly quantitative, being central the research done by the principal author [15] about Lactational Amenorrhea and by the World Health Organization [21].

## Physiology

In most mammalian species, lactation suppresses fertility. In humans, this phenomenon is expressed as LA; which suppresses fertility in normally nourished and healthy women. Among women who are breastfeeding, the return of normal fertility follows relative well defined pathways: an almost complete inhibition of pulsatile gonadotrophin-releasing hormone / luteinizing hormone (GnRH/LH) secretion is evident in the early stages of lactation [22].

The variability in the duration of LA among women is related to the variation in the strength of the suckling stimulus, an unique situation between each mother and baby. However, multiple components contribute to the maintenance of lactational infertility in humans. Unfortunately, data are extremely limited regarding the precise nature, importance, and prevalence of the specific neuroendocrine mechanisms involved. One of the most known factors involved in the maintenance of LA are the high frequency of breastfeeding and the absence of supplementary feeding. Campino et al. [19] reported that

Variable	Length of Amenorrhea	
	≤ 180 Days n = 21	> 180 Days n = 50
<b>Prolactin (mU/L)</b>		
Basal	1405 ± 170	1628 ± 146
Post suckling	2341 ± 278	3035 ± 255
Delta	936 ± 174	1171 ± 161
<b>E<sub>2</sub> (pmol/L)</b>	224 ± 27	156 ± 10 <sup>a</sup>
<b>Prolactin post suckling/E2 ration</b>	13.3 ± 2	25.0 ± 4 <sup>b</sup>
Results are expressed as mean ± SE a. - p=0.009 b. - p=0.006		

**Table 1:** Prolactin and estradiol levels at the third postpartum month in fully nursing amenorrheic women according to the length of LA (Valdes et al. 1991).

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the post-suckling PRL:E2 ratio may help to predict the LA duration in fully nursing women. Our published data [15,21] indicated that E2 levels or PRL/E2 ratio could be predictive of this condition (Table 1).

Therefore, it is possible to argue that higher levels of E2 are related to the recovery of ovulation and menses in fully breastfeeding women. Higher E2 levels in the ovulatory group may contribute to a decreased sensitivity of hypothalamus to the suckling stimulus. Thereby, the endocrine profile is possibly related to a distinct risk of reinitiating ovarian function during breastfeeding, among women with comparable nursing patterns. This, in turn, may be determined at the third postpartum month, through higher levels of E2 and lower levels of PRL:E2 ratio. An important factor in maintaining amenorrhoea during lactation is a high nursing frequency and the absence of supplementary feedings [12,23] suckling induces a greater release of PRL among women who experience long LA (> six months) than among those who experience short LA (< six months). Prolactin response to suckling reaches its maximum at thirty minutes after the initiation of a suckling episode [9,19,20,24,25]. Also, basal E2 concentration showed differences among nursing women [11,12].

### Clinical Characteristics and Management

Despite the majority of researches show that exclusive breastfeeding delays the resumption of ovarian cyclicity, it is important to know that a high proportion of women have their postpartum menstrual cycle before the sixth postpartum month [1,3,26,27]. Many factors, including infant feeding practices, in particular, the frequency and the duration of suckling episodes, determine the resumption of ovarian cyclicity and menses [30-32]. The duration of LA varies across individuals and populations [31-34] so it can be as short as two or three months in Western societies, or as long as three years in hunter-gathered societies in the Kalahari desert of Botswana and Namibia [1,35-38].

The World Health Organization [21] conducted a multinational study in order to determine the relationship between the breastfeeding behaviour of the mother and the duration of post-partum amenorrhoea, and if there were any differences in the duration of LA for similar breastfeeding practices among different populations. A total of 4,118

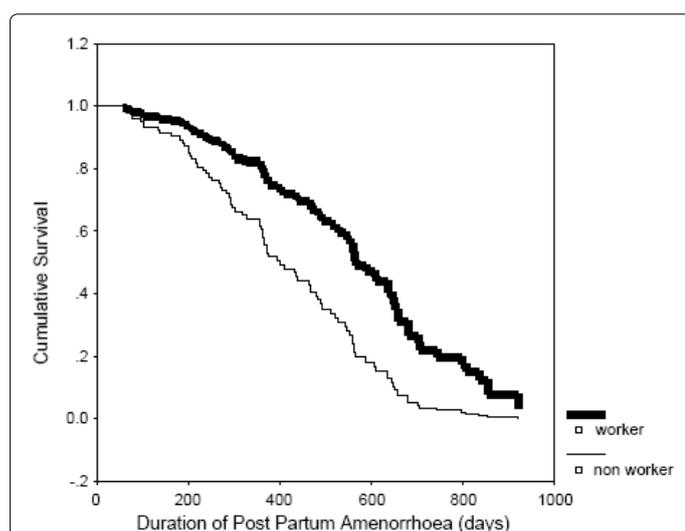
breastfeeding mothers and their infants from seven countries were included (Guatemala, China, Australia, India, Nigeria, Chile and Sweden). Participants were women between 20 and 37 years-old, multigravid, with previous breastfeeding experiences. In order to participate in the study, women had to keep a detailed record of daily infant feeding patterns, including frequency and duration of suckling episodes. Multivariate analyses revealed multiple factors related to the duration of postpartum amenorrhoea, some of which were related to the infant feeding behaviour; while others, to a low body mass index (BMI), number of pregnancies, and higher frequency of infants' illness. In addition, there were considerable variations among the seven countries: India had the lowest median duration of LA (median: 122 days, 95% CI, 111-134); while Guatemala had the longest (median 282 days, 95% CI, 266-304).

The differences in the duration of LA are evident among rural and urban populations. In the decade of 1970, data from Bangladesh showed that the median duration of LA in rural areas was between seventeen and twenty months [39]. Fifteen years later, the mean duration of postpartum amenorrhoea had declined to 12 months [40,41].

Valeggia and Ellison [42] tested the relative metabolic load hypothesis, which attempts to integrate breastfeeding behaviour and maternal nutrition. The research included a group of well-nourished, intensively breastfeeding Argentinian women; and found that resumption of postpartum ovulation occurred after a period of sustained positive energy balances. This finding agrees with Vinoy et al. [43] on a sub-sample of the tea garden women. They showed that tea pickers at 3.5, 10, and 13 postpartum months, had higher 24 hours energy expenditure than housewives. Also, tea pickers' energy intake was higher than non-tea workers, who were in positive energy balance at 3.5 and 13 months, and in negative energy balance only at 10 months. Variation in energy availability seems to be a key factor to explain the variability in the duration of LA, among tea and non-tea workers (Figure 1).

The crucial role of a hypometabolic status was already acknowledged during the impairment of luteinizing hormone (LH) pulsatility in exercising women and in various hormonal alterations seen among recreational runners [44-46]. The same physiological mechanism is likely to operate in breastfeeding women, and can explain the duration of blockage of the ovarian function either among well-nourished Argentinian women, or in mal-nourished Bengali women, compared to the well-nourished women who participated in the multinational study carried out by the WHO.

Majority of research has focused on the role of the inhibition of the normal ovarian cycle [11,47,48] thereby on preventing ovulation and initiation of the menstrual cycle. Thus, it seems that LA should be maintained as long as suckling is maintained. However, most of studies have documented short LA with uninterrupted breastfeeding for periods from six to nine months, or more. On one hand, this may involve other mechanisms, in particular, inbuilt hormonal cycles that maintain the LA period. On the other hand, this offers specific biological advantages for the mother and the baby. Breastfeeding protects the mother from an immediate new pregnancy: hence, LA operates as a natural contraception method. At the same time, breastfeeding is a source of complete nourishment and immune protection for the baby [49-52]. Introduction of supplementary feeding decreases the likelihood of a long LA. However, when women are in amenorrhoea while they are fully of nearly fully breastfeeding, lactation affords 98% protection in the first six postpartum months; providing the basis of the Lactational Amenorrhoea Method (LAM), according to Bellagio Consensus



**Figure 1:** Survival analysis of the duration of post-partum amenorrhoea by working status of the mother. One group is composed of the permanent tea garden workers (workers), the other group of housewives and non-tea workers (non-workers) (Rosetta and Mascie-Taylor, 2009).

Statement [53,54]. Despite LAM is very effective as contraceptive method, many fully nursing women and their physicians are sceptical about its use and resort to other contraceptive methods. Therefore, if the woman wants LAM, she must be informed of its effectiveness and how to identify whether she will recover fertility before or after 6 postpartum months. Thus, she will be able to plan the initiation of contraception accordingly with her physician.

In addition, considerable debate and controversy exist in pediatric circles, regarding the optimal duration of exclusive breastfeeding practices and the beginning of the use of the supplemental foods in infants [55-59]. Breastfeeding and weaning practices are reported with a considerable impact on the infant's health and development, and most researches advocate for fully breastfeeding program as long as is physiologically possible by the mother [57-60]. However, some studies [55,61] have reported the development of iron deficiency anaemia and other deficiencies in essential micronutrients, if supplemental foods are not started around four to six months-old. Also, studies have reported that supplemental feeding started from the beginning with natural breastfeeding have not adversely affected the duration of LA or increased pregnancy rates [7,62,63]. It is necessary to know from mothers, regarding to the duration of LA, a mechanism of implementation of suitable nutritional programmes for infants and other contraception methods

### Lactational amenorrhea and return to fertility

Women who do not breastfeed have a quick recovery of the ovarian function, ovulation and fertility. Typically, the first ovulation occurs between the 4 and 8 weeks postpartum. In contrast, women who breastfeed have a period of LA and infertility that can last from two months to two years or more. This period of infertility related to breastfeeding has contributed significantly to spacing births throughout the history of mankind. In part, the phenomenon of the population growth is due to the decline of breastfeeding and its impact on fertility. The clearest example is that anthropologists observed hunter-gathered groups who live in Kalahari Desert [34,64,65]. Not having crops, they had no food to supplement to the children. Therefore, their survival depended of breastfeeding. In this population, amenorrhea related to breastfeeding lasts more than four years, with the consequent separation of pregnancies. Thus, puberty was delayed and women had only three or four children during their reproductive lives.

Amenorrhea related to breastfeeding has a significant duration, even in those countries where most of women breastfeed during long periods. If in these countries breastfeeding decreases, contraceptive would be needed to replace its demographic effect [66-71]. However, the impact of breastfeeding on amenorrhea and fertility has declined, as part of changes in lifestyles. For example, urbanization and the need of working and studying can interfere with breastfeeding and the necessary frequency of sucking to maintain postpartum amenorrhea and infertility. In fact, amenorrhea effectively protects to breastfeeding women in the first six months postpartum if breastfeeding is exclusive. Under these conditions, the pregnancy rate is less than 2 per 100 women, which is comparable to the more effective contraceptive methods [72-74]. This theme was discussed during the Consensus of Bellagio, where it was called "Lactational Amenorrhea Method (LAM)". Introducing this option in family planning programs is important, to the extent that there is more scientific evidence regarding to operating mechanism and effectiveness.

Pregnancy is extremely rare among breastfeeding women with LA. Under these conditions, LAM users are thought to have 98% protection

from pregnancy. Gross [75] and Short et al. [76] analyzed the LA effectiveness as a single postpartum fertility regulation. Cumulative probabilities of ovulation during LA were 30.9 and 67.3 per 100 women, at six and twelve months: respectively, compared to the 27.2 per 100 women at six postpartum months when all of the criteria of LAM were met. Cumulative pregnancy rate during LA were 2.9 and 5.9 per 100 women at six and twelve postpartum months, compared to 0.7 at six postpartum months for the LAM. Thereby, the probability of pregnancy during LA calculated from this research is similar to the probability of pregnancy given by other modern contraceptive methods. Thus, it seems reasonable for women to rely on LA, without regarding to whether she is fully or partly breastfeeding. LAM provides significant protection from pregnancy; hence, research recommends to health workers to promote breastfeeding practices.

### Conclusion

LA is not fully understood and there is a lack in manipulate the advantages of breastfeeding. Understanding the mechanisms that determine LA should be better explained. It is possible that multiple components contribute to the maintenance of this period. Unfortunately, data is extremely limited regarding the precise nature, importance, and prevalence of the specific neuroendocrine mechanisms involved. At least, the following should be proposed: increase in the tonic inhibitory effects of hypothalamic centres on GnRH secretion, lack of activation of the brain pathways that stimulate GnRH secretion, enhanced inhibitory feedback effects of gonadal products on hypothalamic centres, failure of E2 positive feedback in initiating a midcycle preovulatory luteinizing hormone (LH) surge, diminished number or effective translation of GnRH receptors in the anterior pituitary gonadotrophs, defects in the synthesis, processing, and effective exocytosis of biologically active LH [11,25,47,77,78].

Our ability to recognize these mechanisms is impaired by the lack of knowledge of the behavioural mechanisms determining LA. However, we do know important that the factors related to the maintenance of LA are a high nursing frequency and the absence of supplementary food. Nonetheless, some women will recover ovarian function before six postpartum months. Several studies have found that early endocrinological differences among nursing women who recover ovarian function during the first six postpartum months, and those who remain in amenorrhea during that period. These differences are: lower plasma E2 levels and greater PRL levels. However, these differences cannot be explained by variances in nursing patterns [13,14,79].

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