The diet for lactating mothers

Abstract

Lactation provides for the newborn the proper quantity and quality of food. There are no alimentary restrictions for the mother in the lactating period, but in case of complications such as obesity or gestational diabetes, nutrition counseling is necessary. The milk demand of the infant dictates the mother's capacity of milk production and is influenced by age, growth rate and by any other medical conditions. Breastfeeding offers optimal nutritional intake, even when the mother's food intake is limited, except for the case when the mother has a chronically deficient diet. Energy requirement depends on maternal age, weight, height and level of physical activity, alongside the necessary elements for milk synthesis. The micronutrients and macronutrients requirements depend on the maternal nutritional status, the mobilization of tissue deposits and on their rate in milk secretion, in order to provide a proper growth and development of the newborn. Weight gain or loss in lactation is similar as in nonpregnant women, but weight loss after pregnancy is influenced by factors such as weight before pregnancy, age, parity, race, smoking status, the amount of physical exercises and if the mother returns to work outside her home. Special situations such as multiple gestations, obesity or recent bariatric surgery require support and encouragement for a proper breastfeeding.

Keywords: *breastfeeding, pregnancy, nutrition, energy, obesity, maternal milk*

Rezumat

Alăptarea îi oferă nou-născutului calitatea și cantitatea optimă de hrană. În perioada de alăptare, mama nu are restricții alimentare, dar în cazul apariției complicațiilor, precum obezitatea sau diabetul gestațional, consilirea nutrițională este necesară. Necesarul de lapte al nou-născutului dictează capacitatea mamei de secreție, care este influențată și de vârstă, rata de creștere a copilului și de alte patologii asociate. Alăptarea oferă aportul nutrițional optim, chiar și în caz de aport matern limitat, cu excepția dietelor deficitare cronic. Necesarul energetic depinde de vârsta, greutatea, înălțimea și nivelul de activitate fizică al mamei, alături de necesarul pentru sinteza de lapte. Micro- și macronutrienții depind de statusul nutrițional matern, de mobilizarea depozitelor tisulare și de rata de secreție a laptelui, astfel încât să ofere creșterea și dezvoltarea optimă a nou-născutului. Creșterea sau scăderea ponderală este similară cu cea a femeilor negravide, dar scăderea ponderală post-partum este influențată de factori precum greutatea dinainte de sarcină, vârstă, paritate, rasă, statusul de fumător, cantitatea de activitate fizică și de momentul când mama se întoarce la locul muncă. Situațiile speciale, precum sarcini multiple, obezitate sau chirurgia bariatrică recentă, necesită suport și încurajare pentru un alăptat optim.

Cuvinte-cheie: *alăptat, sarcină, nutriție, necesar energetic, obezitate, lapte matern*

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Introduction

Lactation represents a physiological challenge as well as an important role for the mother because she is the main feeding source for the newborn, the nutrients being qualitatively and quantitatively adequate for the newborn. Maternal milk also presents protective factors such as antibodies, in order to ensure a healthy neonatal growth and development, even in case of maternal deprivation. There are no alimentary restrictions for the mother in the lactating period, but it is important to emphasize the fact that milk production affects the maternal nutritional status, therefore, for maintaining the mother's health, there is an increased requirement for nutritional intake[1]. Lactation requires nutrition counseling, especially in case of complications that can occur, such as gestational diabetes, so that the mother could be carefully dietary counseled in order to face these challenges[2].

Factors that influence milk production

Initially, healthy exclusively lactating females produce approximatively 750-800 mL of milk per day, when the process is just setting up, and can increase the quantity to over 2000 mL milk per day in hyperlactation status or in case of lactating twins or triplets[3].

It is important to emphasize that milk volume is smaller in the first two days postpartum and starts to gradually increase in the third and fourth day, reaching the active lactation period volume, and after six months it begins to decrease, because this is the period when most women start to wean, and is rarely present in late period of lactation[3,4].

The milk demand of the infant is the main element that dictates the mother's capacity of milk production – a good example is the case of mothers that lactate twins or triplets. Moreover, the demand is influenced by age, growth rate and by any other medical conditions that influence the infant metabolic necessities or his capacity to properly feed himself. In case of a healthy infant, fed exclusively with maternal milk, it stimulates the maternal production to offer normal volumes and obtain a normal growth, with no regard to the individual variations of the time between meals. In case of milk

substitutes use or of solid food, the demand is decreased and, consequently, the production also decrease[5-7].

Maternal nutrition does not influence the milk production in case of only small or moderate variations that do not alter the energetic balance and, also, in case of aerobic exercises which lead at most to a moderate weight loss[8-11].

Other factors that mainly determine a decrease of milk production volume are incomplete breast emptying, rarely milk expression, stress, tiredness, anxiety, maternal smoking and acute or chronic illnesses, while the combined estrogen/progesterone oral contraceptives determine only a moderate reduction in maternal milk production. Moreover, the skin to skin contact from the neonate intensive care unit between mother and the premature newborn leads to an increase in milk production[12].

The link between milk's quality and mother's diet

Breastfeeding requires extranutrients and energy from the mother's diet, but the quality of milk can be compensated by the mother's deposits, even when the mother's food intake is limited, except for the case when the mother has a chronically deficient diet[3].

The maternal intake of proteins does not affect the quantity or quality of the proteins from milk, even in malnourished females[13]. The quality and type of fat consumed by the mother influence the fatty acid composition of milk – for example, the maternal consumption of 200-300 mg long-chain omega-3 polyunsaturated fatty acids (n-3 LCPUFA), which include docosahexaenoic acid (DHA), is recommended for its importance in the development of the infant's brain[13]. DHA can be obtained from 1-2 servings of fish per week. The fat-soluble vitamins depend on maternal reserves: vitamin D has low levels in breast milk, especially in mothers with dark skin or with other causes of maternal vitamin D deficiency, so all infants need vitamin D supplements to prevent rickets[14,15]; vitamin K is predominantly in low levels in breast milk, but the level varies depending on the mother's intake, therefore infants are at risk of bleeding secondary to vitamin K deficiency, which can be prevented by routine administration of vitamin K at birth. vitamin A is present in variable levels in breast milk, depending on the mother's diet, and a severe deficiency has clinical impact and is rare in the absence of malabsorptive diseases. Water-soluble vitamins levels depend on the mother's diet, but are adjusted to not become excessive, even in case of high maternal intake, while in case of maternal deficit, they respond to supplementation: vitamin C level is below 160-200 mcg/L; thiamine (vitamin B1) level is below 200 mcg/L, and milk levels are low in case of deficiency (beriberi disease); vitamin B6 (pyridoxine) levels in milk quickly respond to maternal intake changes; folate is secreted in milk despite the maternal reserves, but in severe deficits, the concentrations are reduced and increase in case of supplementation; vitamin B12 level depends on maternal reserves, being reduced in maternal deficit, as in vegan or malnourished females, latent pernicious anemia or after gastric surgical bypass; there are reports of irreversible delay in the development in exclusively breastfeed infants from mothers with vitamin B12 deficiency, so it is advisable to monitor the mother's status of vitamin B12 levels and to supplement with oral or parenteral vitamin B12 in deficit. Minerals' level are independent of the maternal diet or serum concentrations, although the intake of certain oligominerals affects their level in milk: calcium, phosphorus and magnesium are independent of maternal serum levels and are not substantially influenced by variations in alimentary intake; iron, copper and zinc levels in milk are independent of the mother's nutritional status; iodine and selenium levels in milk depend on plasma concentration, which is also dependent on the diet[16-18].

Lactation is also supported by the mobilization of tissue deposits, which influences maternal weight and nutritional status, such as body weight – normally, an approximatively 8 kg weight gain that accounts for the fetus, amniotic fluid, placenta and maternal tissular adaptation is present, but postpartum weight changes in lactating women are highly variable, from a mild, gradual weight loss, that usually occurs in the first six months postpartum, to excessive weight gain during pregnancy which is one of the strongest predictors of postpartum weight change in most studies[2]. Postpartum weight changes in breastfeeding: mostly, lactation has a reduced effect of weight loss and, practically, their causal relationship is small or absent, only in a few cases the weight loss was lower in breastfeeding women than in nonbreastfeeding women or when weight loss was higher in breastfeeding women than in nonbreastfeeding women. However, it is important to follow in the evaluation the intensity of breastfeeding. The main factors that contribute to weight loss after pregnancy are the weight before pregnancy, age, parity, race, smoking status, amount of physical exercise and if the mother return to work outside the home[19-23]. Fat-soluble and water-soluble vitamins are secreted into milk, therefore the need for most vitamins is increased during breastfeeding. In case of a chronically deficient diet, the maternal reserves will deplete for some vitamins, so dietary supplementations will be needed. The bone minerals transiently decrease during breastfeeding, when bone resorption occurs and estradiol has relatively low concentrations, so compensatory remineralization takes place after weaning and reinstallation of menstruation. The changes in the homeostasis of calcium, phosphorus and magnesium are independent of the mother's food intake and feeding does not increase the risk of long-term bone fractures[24-27]. The lean body weight is maintained during the first six months of lactation, even in case of women who lose weight while breastfeeding under optimal intake, by the adaptive response of protein metabolism when dietary proteins are restricted, so that the degradation of body proteins is reduced as compared to their synthesis[28-29].

Nutrient requirements

Nutritional requirements in lactation are high and, for many aspects, they are higher in breastfeeding than in pregnant or nonpregnant women. For example, a

greater need is for proteins, vitamins A, C, E, B6 and B12, folic acid, niacin, riboflavin and thiamine; minerals such as iodine, selenium and zinc are secreted more in pregnant women. Similar requirements are for vitamins D and K, calcium, fluoride, magnesium and phosphorus, while a lower need during breastfeeding, due to lactation amenorrhea, is in case of iron.

Energy requirement depends on maternal age, weight, height and the level of physical activity (Table 1), added to the following requirements for milk synthesis[30]: between 0 and 6 months postpartum, 330 kcal more than for nonbreastfeeding women per day, respectively 500 kcal for an average milk production of 780 ml/day and an average energy content of 67 kcal/100 ml). In well-fed women, the energy of breastfeeding is provided by reserves mobilization (approximately 170 kcal/day), due to the gradual loss of weight accumulated during pregnancy, respectively in the first six months postpartum[31]. On the other hand, between 7 and 12 months postpartum, lactating women require 400 kcal/day more than for non-breastfeeding women, for an average milk production of 600 ml/day and the same energy content, without mobilizing tissue stores, the mother's weight being stable.

For women with normal Body Mass Index and average height, the total energy requirements are 2130-2730 kcal/day in the first six months of lactation and 2200-2800 kcal/day thereafter, depending on mother's age, weight, height and activity level and also on the time and rate of weaning.

The recommended dietary dose (RDA) for the first six months of lactation is 71 grams of proteins per day, an increase of 25 grams than the requirement for non-breastfeeding women, if we rely on the volume of milk of 780 ml/day, that has an average milk protein content of 1 g/100 ml and a 47% efficiency in the use of food proteins for milk synthesis. The other micronutrients and carbohydrates should range 45-64% of calories/day, including almost 6-9 servings of whole grain daily, while the fat intake should range 20-35% of calories/day, similar to nonpregnant women[2].

Vitamins and minerals with increased need in breastfeeding are vitamins A and E, in order to compensate for the vitamins secreted in milk, and after six months of breastfeeding the need returns to that of women who do not breastfeed. Vitamins D and K requirements do not increase during breastfeeding, but breast milk does not provide enough amounts in order to meet the necessities of the infant, therefore supplementation is needed. Vitamin K is usually given to the baby at birth, while vitamin D can be provided by infant supplementation or by maternal high dose supplementation. Vitamins C and B requirements in breastfeeding women exceed those of nonbreastfeeding women, integrating the amount of nutrients secreted in milk with individual metabolic variations (Table 2)[32-33].

The recommended daily dose for calcium during breastfeeding is 1000 mg/day in women over 19 years of age and above 1300 mg/day for adolescents, requirements similar to those of nonbreastfeeding women, although approximately 200 mg/day of calcium are secreted in milk. Phosphorus and magnesium requirements are similar to those of nonbreastfeeding women, due to increased bone resorption and decreased urinary excretion, independent of food intake during breastfeeding[34-35].

Mineral requirement include an iron dose during breastfeeding of 9 mg/day for women over 19 and 10 mg/day for adolescents; lower doses than for non-breastfeeding women (18 mg/day) and adolescents (15 mg/day) due to lactation-induced amenorrhea, which decreases iron loss; an iodine higher dose during breastfeeding (290 mcg/day) than during pregnancy (220 mcg/day) and before pregnancy (150 mcg/day) is recommended for an adequate infant growth and for optimal neurological development; zinc and selenium moderately higher doses are also recommended daily during breastfeeding than for nonpregnant and non-breastfeeding women to compensate for their secretion into breast milk. Fish and shellfish contribute with high quality protein and other essential nutrients, such

Table 1 Caloric estimated requirements in reproductive age females (nonpregnant and nonlactating)

Age (years)	Sedentary (kcal/day) (only physical activity for maintaining vital functions)	Moderate (kcal/day) (activity for maintaining vital functions and normal walking of 2.5-5 km/day)	Moderate (kcal/day) (activity for maintaining vital functions and normal walking of >5 km/day)
15-18	1800	2000	2400
19-25	2000	2200	2400
26-30	1800	2000	2400
31-50	1800	2000	2200
51-55	1600	1800	2200

Table 2 Nutritional recommendations for vitamins with high requirement in lactation

	Healthy female recommended dose	Milk secretion	Efficiency	Lactating female recommended dose
Vitamin C	75 mg/day	40 mg/day	85%	120 mg/day
Thiamine	1.1 mg/day	0.16 mg/day	0.1 mg/day	1.4 mg/day
Riboflavin	1.1 mg/day	0.3 mg/day	0.1 mg/day	1.6 mg/day
Niacin	14 mg/day	1.4 mg/day	1 mg/day	17 mg/day
Vitamin B6	1.3 mg/day	0.1 mg/day	0.48 mg/day	2 mg/day
Folic acid	400 mcg/day	66 mcg/day	66 mcg/day	500 mcg/day
Vitamin B12	2 mcg/day	0.33 mcg/day		2.8 mcg/day

as large amounts of long-chain omega-3 polyunsaturated fatty acids (LCPUFA n-3), including docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which are important for brain development, but a potential disadvantage of fish consumption is the exposure to mercury which is usually present only as traces and does not cause health issues, so it is recommended to avoid shark, swordfish, tilefish or king mackerel[2].

Special diets, such as the ones for weight loss, could be undergone after lactation establishment in overweight or obese women, if they restrict their energy intake by 500 kcal/day and do aerobic exercise four days a week, in order to promote weight loss of 0.5 kg/week without compromising the milk intake, because exercise without diet does not promote postpartum weight loss.

Vegetarian diet has a potential risk for deficiencies of minerals, proteins and vitamins. Depending on the degree of dietary restriction (for example ovo- or lactovegetarian), calcium, vitamin D and vitamin B12 supplements may be required for an optimal intake. Vegan diet in healthy women who do not eat meat, chicken, fish or dairy products should be supplemented with B12 vitamin. Fasting for short term does not diminish the amount of milk, but can have a minor effect on the composition of milk, through metabolic adaptations that protect milk production. Long-term fasting can adversely affect the nutritional status of breastfeeding women, so they may be exempted from fasting for medical reasons. Diets with avoidance of food to prevent atopic disease in offspring should not avoid certain foods such as peanuts, milk and eggs, even in children at high risk. Breastfeeding secondary to bariatric surgery should be encouraged because it provides milk with adequate energy content, macronutrients and vitamin A, but vitamin and mineral supplements should be continued and any nutrient deficiencies, such as vitamin B12, should be monitored.

In alcohol consumption, a small percentage passes into breast milk, so it is recommended to limit alcohol consumption and, in case of consumption of one unit of alcohol, the exposure of the baby to alcohol should be avoided, waiting for at least two hours before breastfeeding, while in case of consumption of more than one unit of alcohol it is not recommended and may affect the judgment and ability of the mother to care for the child, therefore it should be avoided, regardless of how the baby is fed.

Caffeine should be consumed in moderate amounts of 2-3 cups of caffeinated beverage per day, because some babies are sensitive to caffeine and become irritable or have altered sleep, even with small amounts of caffeine, but the baby's sensitivity to caffeine usually decreases over time, as caffeine elimination is initially slow in newborns, increasing at 3-5 months.

Sweeteners such as saccharin, sucralose and acesulfame potassium have been identified in human breast milk in low amounts, while aspartame is not secreted into human breast milk, even when consumed in amounts that far exceed the typical amounts.

Discussion

The recommended daily dose of calcium is not increased during breastfeeding due to the fact that lactation-induced bone loss is not countered by an increase of calcium intake and the bone loss is recovered after weaning. In addition, the calcium content of breast milk is not affected by breast calcium intake, as reduced bone mobilization and decreased urinary excretion provide the calcium requirement for milk production[34-35].

The syndrome of "lactation ketoacidosis" in breastfeeding women with restrictive diet, especially with a low carbohydrate intake, is a form of fasting ketosis, accelerated by the increased energy needs of breastfeeding women. The symptoms and signs include nausea, vomiting and abdominal pain with ketoacidosis and changes in acid-base balance, with high anionic deficiency[36].

The milk production is generated mainly by the infant demand rather than the mother's capacity; the micronutrient supplementations should be appropriate,

even for twins breastfeed of 40-90% of mothers. Mothers with obesity have low rates of initiating and maintaining breastfeeding, generated by a combination of factors such as biological (i.e., altered lactation), psychological (i.e., embarrassment and difficulty in breastfeeding freely), mechanical (i.e., difficult latching), and medical factors (i.e., development of diabetes, thyroid dysfunction, or need of caesarean delivery), or a combination of factors, therefore it is important to support and encourage females with obesity to breastfeed. For women who undergone bariatric surgery, few data are available, but it appears that they have a similar milk composition[2].

Conclusions

In conclusion, although they do not have food restrictions, mothers should be counseled not only during pregnancy, but also in the lactation period to include all the food principles, have an enriched diet, based on high quality proteins, fatty acids, including docosahexaenoic acid, carbohydrates, fruits and vegetables, to supplement when necessary, so that the infant will have a normal weight gain, corresponding to his age, as well as a normal neurological development. ■

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References

1. Huang Z, Hu YM. Dietary patterns and their association with breast milk macronutrient composition among lactating women. Int Breastfeed J. 2020;15:1-10.
2. Kominiarek MA, Rajan P. Nutrition Recommendations in Pregnancy and Lactation. Med Clin North Am. 2016;100(6):1199-215.
3. Institute of Medicine (US) Committee on Nutritional Status During Pregnancy and Lactation. Nutrition During Lactation. Washington (DC): National Academies Press (US); 1991. PMID: 25144080.
4. Neville MC, Keller R, Seacat J, et al. Studies in human lactation: milk volumes in lactating women during the onset of lactation and full lactation. Am J Clin Nutr. 1988;48(6):1375-86.
5. Dewey KG, Heinig MJ, Nommsen LA, Lonnerdal B. Maternal versus infant factors related to breast milk intake and residual milk volume: the DARLING study. Pediatrics. 1991;87(6):829-37.
6. Michaelsen KF, Larsen PS, Thomsen BL, Samuelson G. The Copenhagen Cohort Study on Infant Nutrition and Growth: breast-milk intake, human milk macronutrient content, and influencing factors. Am J Clin Nutr. 1994;59(3):600-11.
7. Stuff JE, Nichols BL. Nutrient intake and growth performance of older infants fed human milk. J Pediatr. 1989;115(6):959-68.
8. McCrory MA, Nommsen-Rivers LA, Molé PA, Lönnerdal B, Dewey KG. Randomized trial of the short-term effects of dieting compared with dieting plus aerobic exercise on lactation performance. Am J Clin Nutr. 1999;69(5):959-67.
9. Dusdieker LB, Hemingway DL, Stumbo PJ. Is milk production impaired by dieting during lactation? Am J Clin Nutr. 1994;59(4):833-40.
10. Butte NF, Garza C, Stuff JE, Smith EO, Nichols BL. Effect of maternal diet and body composition on lactational performance. Am J Clin Nutr. 1984;39(2):296-306.
11. Dewey KG, Lovelady CA, Nommsen-Rivers LA, McCrory MA, Lönnerdal B. A randomized study of the effects of aerobic exercise by lactating women on breast-milk volume and composition. N Engl J Med. 1994;330(7):449-53.
12. Hopkinson JM, Schanler RJ, Fraley JK, Garza C. Milk production by mothers of premature infants: influence of cigarette smoking. Pediatrics. 1992;90(6):934-8.
13. Sanchez-Pozo A, Lopez Morales J, Izquierdo A, Martinez-Valverde A, Gil A. Protein composition of human milk in relation to mothers' weight and socioeconomic status. Hum Nutr Clin Nutr. 1987;41(2):115-25.
14. Delgado-Noguera MF, Calvache JA, Bonfill Cosp X, Kotanidou EP, Galli-Tsinopoulou A. Supplementation with long chain polyunsaturated fatty acids (LCPUFA) to breastfeeding mothers for improving child growth and development. Cochrane Database Syst Rev. 2015;(7):CD007901.
15. Misra M, Pacaud D, Petryk A, Collett-Solberg PF, Kappy M; Drug and Therapeutics Committee of the Lawson Wilkins Pediatric Endocrine Society. Vitamin D deficiency in children and its management: review of current knowledge and recommendations. Pediatrics. 2008;122(2):398-417.
16. Krebs NF, Reidinger CJ, Hartley S, Robertson AD, Hambidge KM. Zinc supplementation during lactation: effects on maternal status and milk zinc concentrations. Am J Clin Nutr. 1995;61(5):1030-6.
17. Siimes MA, Salmenperä L, Perheentupa J. Exclusive breast-feeding for 9 months: risk of iron deficiency. J Pediatr. 1984;104(2):196-9.
18. Gushurst CA, Mueller JA, Green JA, Sedor F. Breast milk iodide: reassessment in the 1980s. Pediatrics. 1984;73(3):354-7.
19. Potter S, Hannum S, McFarlin B, Essex-Sorlie D, Campbell E, Trupin S. Does infant feeding method influence maternal postpartum weight loss? J Am Diet Assoc. 1991;91(4):441-6.
20. Ohlin A, Rössner S. Maternal body weight development after pregnancy. Int J Obes. 1990;14(2):159-73.
21. Schauberger CW, Rooney BL, Brimer LM. Factors that influence weight loss in the puerperium. Obstet Gynecol. 1992;79(3):424-9.
22. Greene GW, Smiciklas-Wright H, Scholl TO, Karp RJ. Postpartum weight change: how much of the weight gained in pregnancy will be lost after delivery? Obstet Gynecol. 1988;71(5):701-7.
23. Baker JL, Gamborg M, Heitmann BL, Lissner L, Sørensen TI, Rasmussen KM. Breastfeeding reduces postpartum weight retention. Am J Clin Nutr. 2008;88(6):1543-51.
24. Kent GN, Price RI, Gutteridge DH, et al. Human lactation: forearm trabecular bone loss, increased bone turnover, and renal conservation of calcium and inorganic phosphate with recovery of bone mass following weaning. J Bone Miner Res. 1990;5(4):361-9.
25. Sowers M, Corton G, Shapiro B, et al. Changes in bone density with lactation. JAMA. 1993;269(24):3130-5.
26. Grizzo FMF, Alarcão ACJ, Dell' Agnolo CM, et al. How does women's bone health recover after lactation? A systematic review and meta-analysis. Osteoporos Int. 2020;31(3):413-427.
27. Breastfeeding Programs and Policies, Breastfeeding Uptake, and Maternal Health Outcomes in Developed Countries. Feltner C, Weber RP, Stuebe A, Grodensky CA, Orr C, Viswanathan M. (Eds), Agency for Healthcare Research and Quality (US), Rockville (MD) 2018.
28. Motil KJ, Sheng HP, Kertz BL, Montandon CM, Ellis KJ. Lean body mass of well-nourished women is preserved during lactation. Am J Clin Nutr. 1998;67(2):292-300.
29. Motil KJ, Davis TA, Montandon CM, Wong WW, Klein PD, Reeds PJ. Whole-body protein turnover in the fed state is reduced in response to dietary protein restriction in lactating women. Am J Clin Nutr. 1996;64(1):32-9.
30. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2020-2025. 9th ed. Dec 2020. https://www.dietaryguidelines.gov/ (accessed in 2021).
31. DRI, Dietary Reference Intakes: For Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients). Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food, and Nutrition Board, Institute of Medicine. Nat Acad Press, Washington, DC 2005.
32. DRI, Dietary Reference Intakes: For Vitamin C, Vitamin E, Selenium, and Carotenoid. Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food, and Nutrition Board, Institute of Medicine. Nat Acad Press, Washington DC, 2000.
33. Standing Committee on the Scientific Evaluation of Dietary Reference Intakes IoM. Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline. Nati Acad Press, Washington DC, 1998.
34. Specker BL, Vieira NE, O'Brien KO, et al. Calcium kinetics in lactating women with low and high calcium intakes. Am J Clin Nutr. 1994;59(3):593-9.
35. Hopkinson JM, Butte NF, Ellis K, Smith EO. Lactation delays postpartum bone mineral accretion and temporarily alters its regional distribution in women. J Nutr. 2000;130(4):777-83.
36. Al Alawi AM, Al Flaiti A, Falhammar H. Lactation Ketoacidosis: A systematic review of case reports. Medicina (Kaunas). 2020;56(6):299.