

1-1-2008

## Effect of Lactation on Bone Mineral Density Later in Life in Turkish Women

ORHAN AKSAKAL

HAKAN AYTAN

SABRİ CAVKAYTAR

ÖMER LÜTFİ TAPISIZ

TAYFUN GÜNGÖR

*See next page for additional authors*

Follow this and additional works at: <https://journals.tubitak.gov.tr/medical>



Part of the [Medical Sciences Commons](#)

---

### Recommended Citation

AKSAKAL, ORHAN; AYTAN, HAKAN; CAVKAYTAR, SABRİ; TAPISIZ, ÖMER LÜTFİ; GÜNGÖR, TAYFUN; ÖZDAL, BÜLENT; and MOLLAMAHMUTOĞLU, LEYLA (2008) "Effect of Lactation on Bone Mineral Density Later in Life in Turkish Women," *Turkish Journal of Medical Sciences*: Vol. 38: No. 4, Article 7. Available at: <https://journals.tubitak.gov.tr/medical/vol38/iss4/7>

This Article is brought to you for free and open access by TÜBİTAK Academic Journals. It has been accepted for inclusion in Turkish Journal of Medical Sciences by an authorized editor of TÜBİTAK Academic Journals. For more information, please contact [academic.publications@tubitak.gov.tr](mailto:academic.publications@tubitak.gov.tr).

---

## Effect of Lactation on Bone Mineral Density Later in Life in Turkish Women

### Authors

ORHAN AKSAKAL, HAKAN AYTAN, SABRİ CAVKAYTAR, ÖMER LÜTFİ TAPISIZ, TAYFUN GÜNGÖR, BÜLENT ÖZDAL, and LEYLA MOLLAMAHMUTOĞLU

## Effect of Lactation on Bone Mineral Density Later in Life in Turkish Women\*

Orhan AKSAKAL  
Hakan AYTAN  
Sabri CAVKAYTAR  
Ömer Lütfi TAPISIZ  
Tayfun GÜNGÖR  
Bülent ÖZDAL  
Leyla MOLLAMAHMUTOĞLU

**Aim:** To investigate the probable effect of lactation on bone mineral density (BMD) later in life.

**Materials and Methods:** Eighty-seven premenopausal and 18 postmenopausal Turkish women were classified into four groups according to age. Age, height, weight, menopausal status, age at menopause (in postmenopausal women), years since menopause (in postmenopausal woman), parity and total lactation period were recorded. Lumbar spine BMD (L2-L4) was measured by dual-energy X-ray absorptiometry (DEXA). In each group, correlations of lactation with BMD were investigated using Pearson correlation test, and multiple regression analyses were used to determine the factors associated with BMD.

**Results:** No significant correlation was determined between total lactation period and BMD in any subgroup. This result did not change after adjusting for age, height, weight and parity.

**Conclusions:** Total lactation period does not seem to be a determinant of BMD later in life in Turkish women.

**Key Words:** Bone mineral density, lactation, dual-energy X-ray absorptiometry (DEXA)

Dr. Zekai Tahir Burak Women's Health  
Education and Research Hospital,  
Ankara -TURKEY

### Türk Kadınlarında Emzirmenin Hayatın İleriki Yıllarındaki Kemik Mineral Dansitometresi Üzerine Etkileri

**Amaç:** Emzirmenin hayatın ileriki yıllarındaki kemik mineral dansitometresi üzerine olası etkilerinin araştırılması.

**Yöntem ve Gereç:** Olgular 87 pre-menapozal ve 18 post-menapozal Türk kadınından oluşmakta idi. Yaşa göre olgular 4 gruba ayrıldılar. Yaş, boy, kilo, menopozal durum, menapoza girme yaşı ve menopozda geçirilen yıl (postmenapozal kadınlar için), parite ve total laktasyon periodları kaydedildi. Lumbal omurga kemik mineral dansitometri (KMD) (L2-L4) ölçümleri dual-enerji X-ray absorbtometri (DEXA) cihazı ile yapıldı. Bütün gruplarda laktasyon ile KMD arasındaki ilişki Pearson Korelasyon Analizi kullanılarak incelendi. KMD ile ilişkili faktörleri belirlemede Çoklu Regresyon Analizi kullanıldı.

**Bulgular:** Bütün gruplarda total laktasyon periodu ile KMD arasında anlamlı bir ilişki saptanmadı. Bu sonuç yaş, boy, kilo ve parite gibi parametrelerin düzenlenmesi ile de değişmedi.

**Sonuç:** Total laktasyon periodu Türk kadınlarında hayatın ileriki yıllarındaki KMD için belirleyici bir etken olarak gözükmemektedir.

**Anahtar Sözcükler:** Kemik mineral dansitometresi, laktasyon, dual-enerji X-ray absorbtometri (DEXA)

Received: October 01, 2007  
Accepted: May 05, 2008

#### Correspondence

Ömer Lütfi TAPISIZ  
Turan Güneş Bulvarı  
Sedir Sitesi C2 Blok No: 6  
06450 Or-An,  
Ankara - TURKEY

omertapisiz@yahoo.com.tr

#### Introduction

Osteoporosis is an important health problem worldwide, characterized by low bone mass and micro-architectural deterioration of bone structure (1,2). Bone mineral density (BMD) is the best predictor for osteoporotic bone fractures. BMD is influenced by genetics, the environment, nutrition, physical exercise, diseases and drugs. Peak bone mass is the major determinant of BMD and is attained in the early thirties (3), the period of life in which pregnancy and lactation usually occur.

During pregnancy, mineralization of the fetal skeleton requires approximately 30 g calcium from maternal sources (4). Furthermore, abundant calcium is lost from the

\* This study was presented as a poster presentation at the VIth International Congress of the Turkish-German Gynecological Association, Antalya, Turkey, 18-22 May 2005.

mother during lactation. These data suggest that BMD may change during and after pregnancy.

Although the exact role of pregnancy on BMD is currently under investigation, it has been shown that a 5% to 6% transitory bone mass reduction occurs after six months of lactation (5). However, there is controversy about the effects of lactation on BMD later in life. Some studies have shown an increase (6), others have suggested a decrease (7-9), and some even report no change (10,11).

In this study, we studied reproductive history and BMD of 87 premenopausal and 18 postmenopausal Turkish women. The purpose of this study was to ascertain whether lactation history is an independent risk factor for low BMD with possible inter-correlations (parity, weight, age and menopausal status).

## Materials and Methods

### Population

Fully informed consent was obtained from 87 premenopausal and 18 postmenopausal Turkish women aged 40-60 years old who were randomly recruited at Dr. Zekai Tahir Burak Women's Health Hospital, Ankara, between 2001 and 2002. All of the subjects were in good health according to medical evaluation. All postmenopausal women experienced natural menopause and no one had been treated with hormone replacement therapy (HRT). There was no history of alcohol intake, smoking or physical exercise. Subjects were classified into four subgroups in five-year increments as: group 1 (<40 years old) (n:33; 1 of whom was postmenopausal); group 2 (40-44 years old) (n:36; including 4 postmenopausal); group 3 (45-49 years old) (n:27; including 6 postmenopausal); and group 4 (>50 years old) (n:9; including 7 postmenopausal).

### Methods

A questionnaire including age, height, weight, parity, total lactation period, menopausal status, age at menopause and years since menopause (YSM) was completed by all subjects. Subjects were weighed on an electric scale wearing minimal clothing. Height was measured to the nearest centimeter using a stadiometer.

Total lactation period was described in total months for all combined pregnancies and parity was calculated as number of live births. Postmenopausal status was described as menstruation totally stopped for at least one year. Lumbar spine BMD (L2-L4) was measured by dual energy X-ray absorptiometry (DEXA) (QDR-4500SL, Hologic, Inc, MA, USA). This study protocol was approved by the ethical committee.

### Statistical Analyses

SPSS version 10.0 was used for statistical analyses and a p value < 0.05 was assumed to be significant. Correlations between the variables were investigated using Pearson's correlation test and multiple regression analyses. On multiple regression analyses, the dependent variable was lumbar spine BMD, while independent variables were age, height, weight, parity, menopausal status, and age at menopause and YSM in postmenopausal women.

On multiple regression analyses, the strength of correlation between BMD and variables was assessed by a standard regression coefficient.

## Results

Baseline characteristics and reproductive history including parity and total lactation period in each group are depicted in Table 1. The groups were similar with regard to BMD, height, weight, parity and total lactation period ( $P > 0.05$  for all groups). Total lactation period was not statistically different between groups ( $P > 0.05$ ), and mean parity was also similar ( $P > 0.05$ ).

No correlations were determined between total lactation period and age ( $r = 0.06$ ,  $P = 0.513$ ), YSM ( $r = -0.073$ ,  $P = 0.773$ ), or lumbar BMD ( $r = 0.047$ ,  $P = 0.628$ ). However, height was found to have inverse ( $r = -0.269$ ,  $P = 0.05$ ) and parity and weight were found to have linear correlations ( $r = 0.594$ ,  $P < 0.001$ ;  $r = 0.369$ ,  $P < 0.001$ , respectively) with total lactation period in all groups (Table 2).

Multiple regression analysis was used to determine the factors that were independently related with lumbar BMD. No factor was found to be independently correlated with lumbar BMD ( $P > 0.05$ ) (Table 3).

Table 1. Baseline characteristics, parity, and total lactation period.

	<40 (years) <sup>o</sup> (n = 33)	40-44 (years) <sup>1</sup> (n = 36)	45-49 (years) <sup>2</sup> (n = 27)	>50 (years) <sup>3</sup> (n = 9)
Age (year)	37 ± 1.5	42.2 ± 1.7	47.3 ± 1.2	56 ± 4.2
BMD(g/cm )	0.57 ± 0.11	0.54 ± 0.10	0.59 ± 0.21	0.48 ± 0.09
Height (cm)	160 ± 2.4	159 ± 3.2	158 ± 3.9	161 ± 4.8
Weight (kg)	67.7 ± 11.4	69.1 ± 13.9	71.4 ± 13.3	69.3 ± 13.5
Parity	1.9 ± 1.2	2.2 ± 1.3	2.3 ± 1.4	2.4 ± 1.1
Total lactation period (month)	24.1 ± 19.7	22.8 ± 19.2	23.8 ± 19.6	25.3 ± 18.1
Age at menopause (year)	39	38.7 ± 4.5	46.3 ± 2.1	47.4 ± 3.9
Years since menopause	1.2	1.3 ± 0.7	2.1 ± 1.8	6.1 ± 3.5

Data are presented as mean ± standard deviation.

BMD: bone mineral density.

<sup>o</sup>one subject was postmenopausal

<sup>1</sup> four subjects were postmenopausal

<sup>2</sup> six subjects were postmenopausal

<sup>3</sup> seven subjects were postmenopausal

Table 2. Correlations of factors.

	Age		Height		Weight		Parity		Lactation period		YSM		BMD	
	r	p	r	p	r	p	r	p	r	p	r	p	r	p
Age	-	-	0.03	0.69	0.14	0.14	0.16	0.09	0.06	0.51	0.53	0.02	-0.10	0.29
Height	0.03	0.69	-	-	0.19	0.05	-0.19	0.04	-0.27	0.005	0.09	0.72	-0.04	0.65
Weight	0.14	0.14	0.19	0.05	-	-	0.17	0.09	0.37	0.001	-0.02	0.9	0.04	0.69
Parity	0.16	0.09	-0.19	0.04	0.17	0.09	-	-	0.59	0.001	-0.51	0.03	0.08	0.40
Lactation period	0.06	0.51	-0.27	0.005	0.37	0.001	0.59	0.001	-	-	-0.07	0.77	0.05	0.63
YSM	0.53	0.02	0.09	0.72	-0.02	0.9	-0.51	0.03	-0.07	0.77	-	-	-0.23	0.36
BMD	-0.10	0.29	-0.04	0.65	0.04	0.69	0.08	0.40	0.05	0.63	-0.23	0.36	-	-

YSM: years since menopause; BMD: bone mineral density.

Table 3. Multiple regression analysis of lumbar spine BMD versus age, height, weight, parity, and total lactation period.

Dependent and independent variables	Standardized regression coefficient	t	p value
Lumbar spine BMD			
Age	-0.0027	-1.218	0.226
Height	-0.1076	-0.037	0.709
Weight	0.0006	0.500	0.617
Parity	0.0083	0.472	0.637
Total lactation period	-0.0003	-0.317	0.751

BMD: bone mineral density.

## Discussion

In this study, we aimed to ascertain whether lactation history is an independent risk factor for low BMD with possible inter-correlations. We found that lactation, although an active metabolic state, does not appear to be associated with BMD later in life. Lack of an association between bone density and breast-feeding was also supported by earlier studies (12,13). Some investigators have found that lactation was associated with greater bone density (6); others found lower bone density with breast-feeding (7-9); and some have reported no change (10,11). Most of these studies involved premenopausal women; however, and the effect of lactation appears to be transient, with no effect on bone density postmenopause (14,15). These differences may depend on study design, number of subjects, follow-up period, statistics and sites of bone measured. Are the bone sites used in measurement important? For example, forearm BMD can not reflect total body mineral density (16). Age adjustment is also necessary to reveal the relationship between lactation and BMD. In this regard, we divided our subjects by age into four subgroups in five-year increments and measured lumbar spine BMD. We found no significant relationship between total lactation period and BMD. Marked changes in calcium metabolism occur during lactation (17), related to amount of breast-milk produced, diet, and duration of lactation. The decrease in BMD averages 4-6% during the first six months of lactation (18). During lactation, the women have a period of considerable hypo-estrogenemia, which negatively affects calcium and phosphate metabolism, as seen in amenorrhea (19), and is widely documented after menopause (20). During lactation, the return of ovarian function varies greatly, so that remarkable differences in bone mass might develop among individuals. Sowers et al. (21) reported that a 5% transitory bone loss occurs in women who breastfed at least six months. They explained

this by an environment of low circulating estradiol, high circulating parathyroid hormone related protein and prolactin concentrations. However, women lactating for more than six months recover bone loss after lactation in extended periods (22). From this angle, the loss of bone mineral during lactating years must have been compensated for later in life so that lactation was not found to be an independent factor affecting bone density.

Bone metabolism is a dynamic process that is affected by various factors during different phases of life including race, ethnicity (23), familial resemblance (24), hormonal status, age at menarche, menstrual irregularities, oral contraceptive usage, pregnancy, lactation, dietary factors, physical activity, smoking, and alcohol consumption (25-27). These factors have different effects on BMD in different stages of life. Thus, effect of lactation on BMD may be masked by greater BMD determinants later in life such as age, menopause, change in diet, change in body size, and altered physical activity. A recent study consisting of 3476 women in the Netherlands found that only age at menopause and menarche have significant associations with BMD (28). Although none of our subjects had a history of alcohol consumption or smoking, we could not evaluate dietary habits (calcium intake) and physical activity in our subjects. This situation could be a limitation of our study.

Based on these results, we conclude that lactation does not seem to be a determinant of BMD later in life after adjusting for age, height, weight and parity. Lactation causes a loss of bone mineral due to hormonal environment; however, BMD is affected by many different factors, each having different influences on different stages of life, and this negative effect of lactation may be masked by greater BMD determinants during life.

## References

1. [No authors listed]. Consensus development conference: diagnosis, prophylaxis, and treatment of osteoporosis. *Am J Med* 1993; 94: 646-50.
2. Kanis JA, Melton LJ 3rd, Christiansen C, Johnston CC, Khaltaev N. The diagnosis of osteoporosis. *J Bone Miner Res* 1994; 9: 1137-41.
3. More C, Bettembuk P, Bhattoa HP, Balogh A. The effects of pregnancy and lactation on bone mineral density. *Osteoporos Int* 2001; 12: 732-7.
4. Nguyen TV, Jones G, Sambrook PN, White CP, Kelly PJ, Eisman JA. Effects of estrogen exposure and reproductive factors on bone mineral density and osteoporotic fractures. *J Clin Endocrinol Metab* 1995; 80: 2709-14.

5. Prentice A, Jarjou LM, Stirling DM, Buffenstein R, Fairweather-Tait S. Biochemical markers of calcium and bone metabolism during 18 months of lactation in Gambian women accustomed to a low calcium intake and in those consuming a calcium supplement. *J Clin Endocrinol Metab* 1998; 83: 1059-66.
6. Hansen MA, Overgaard K, Riis BJ, Christiansen C. Potential risk factors for development of postmenopausal osteoporosis—examined over a 12-year period. *Osteoporos Int* 1991; 1: 95-102.
7. Kritz-Silverstein D, Barrett-Connor E, Hollenbach KA. Pregnancy and lactation as determinants of bone mineral density in postmenopausal women. *Am J Epidemiol* 1992; 136: 1052-9.
8. Gur A, Cevik R, Nas K, Sarac AJ, Ataoglu S, Karakoc M et al. The influence of duration of breastfeeding on bone mass in postmenopausal women of different age groups. *J Bone Miner Metab* 2003; 21: 234-41.
9. Dursun N, Akin S, Dursun E, Sade I, Korkusuz F. Influence of duration of total breast-feeding on bone mineral density in a Turkish population: does the priority of risk factors differ from society to society? *Osteoporos Int* 2006; 17: 651-5.
10. Jones G, Scott FS. A cross-sectional study of smoking and bone mineral density in premenopausal parous women: effect of body mass index, breast feeding and sports participation. *J Bone Miner Res* 1999; 14: 1628-33.
11. Feldblum PJ, Zhang J, Rich LE, Fortney JA, Talmage RV. Lactation history and bone mineral density among perimenopausal women. *Epidemiology* 1992; 3: 527-31.
12. Sowers M, Wallace RB, Lemke JH. Correlates of forearm bone mass among women during maximal bone mineralization. *Prev Med* 1985; 14: 585-596.
13. Bauer DC, Browner WS, Cauley JA, Orwoll ES, Scott JC, Black DM et al. Factors associated with appendicular bone mass in older women. The Study of Osteoporotic Fractures Research Group. *Ann Intern Med* 1993; 118: 657-65.
14. Kent GN, Price RI, Gutteridge DH, Smith M, Allen JR, Bhagat CI 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: 361-9.
15. Lamke B, Brundin J, Moberg P. Changes of bone mineral content during pregnancy and lactation. *Acta Obstet Gynecol Scand* 1977; 56: 217-9.
16. Hu JF, Zhao XH, Chen JS, Fitzpatrick J, Parpia B, Campbell TC. Bone density and lifestyle characteristics in premenopausal and postmenopausal Chinese women. *Osteoporos Int* 1994; 4: 288-97.
17. Specker BL, Tsang RC, Ho ML. Changes in calcium homeostasis over the first year postpartum: effect of lactation and weaning. *Obstet Gynecol* 1991; 78: 56-62.
18. Hayslip CC, Klein TA, Wray HL, Duncan WE. The effect of lactation on bone mineral content in healthy postpartum women. *Obstet Gynecol* 1989; 73: 588-92.
19. Johansen JS, Riis BJ, Hassager C, Moen M, Jacobson J, Christiansen C. The effect of a gonadotropin-releasing hormone agonist analog (nafarelin) on bone metabolism. *J Clin Endocrinol Metab* 1988; 67: 701-6.
20. Cumming RG, Klineberg RJ. Breastfeeding and other reproductive factors and the risk of hip fractures in elderly women. *Int J Epidemiol* 1993; 22: 684-91.
21. Sowers MF, Hollis BW, Shapiro B, Randolph J, Janney CA, Zhang D et al. Elevated parathyroid hormone related peptide associated with lactation and bone density loss. *JAMA* 1996; 276: 549-54.
22. Kolthoff N, Eiken P, Kristensen B, Nielsen SP. Bone mineral changes during pregnancy and lactation: a longitudinal cohort study. *Clin Sci (Lond)* 1998; 94: 405-12.
23. Karagas MR, Lu-Yao GL, Barrett JA, Beach ML, Baron JA. Heterogeneity of hip fracture: age, race, sex, and geographic patterns of femoral neck and trochanteric fractures among the US elderly. *Am J Epidemiol* 1996; 143: 677-82.
24. Pocock NA, Eisman JA, Hopper JL, Yeates MG, Sambrook PN, Eberl S. Genetic determinants of bone mass in adults. A twin study. *J Clin Invest* 1987; 80: 706-10.
25. Prior JC, Vigna YM, Barr SI, Rexworthy C, Lentle BC. Cyclic medroxyprogesterone treatment increases bone density: a controlled trial in active women with menstrual cycle disturbances. *Am J Med* 1994; 96: 521-30.
26. Sowers M. Pregnancy and lactation as risk factors for subsequent bone loss and osteoporosis. *J Bone Miner Res* 1996; 11: 1052-60.
27. Cumming RG. Calcium intake and bone mass: a quantitative review of the evidence. *Calcif Tissue Int* 1990; 47: 194-201.
28. Hagemans ML, van der Schouw YT, de Kleijn MJ, van Staveren WA, Pop VJ, Leusink GL et al. Indicators for the total duration of premenopausal endogenous estrogen exposure in relation to BMD. *Hum Reprod* 2004; 19: 2163-9.