Original Article

HEALTH SCIENCES
MEDICINE

DOI: 10.32322/jhsm.1226051
J Health Sci Med 2023; 6(2): 315-318

Does adolescent pregnancy affect postmenopausal bone mineral density?

Cevdet Adıgüzel, Sevtap Seyfettinoğlu
Department of Obstetric and Gynecology, Adana City Training and Research Hospital, University of Health Science, Adana, Turkey

Cite this article as: Adıgüzel C, Seyfettinoğlu S. Does adolescent pregnancy affect postmenopausal bone mineral density?. J Health Sci Med 2023; 6(2): 315-318.

ABSTRACT

Aim: This study aims to investigate the effect of adolescent pregnancies on bone mineral density in the postmenopausal period and to contribute to this controversial issue.

Material and Method: Our study included 70 women at postmenopausal ages. The participants were divided into two groups. Thirty-five women with a history of pregnancy in adolescence were considered group 1, and 35 women without a history of pregnancy were considered group 2. The BMD was measured in the total hip, femoral neck, and lumbar spine. The data were compared using SPSS version 26, and $p<0.05$ was accepted as a statistical significance level.

Results: While there was a statistically significant difference between the femoral neck and total femur T scores measured in BMD in patients with and without a history of adolescent pregnancies, no statistically significant difference was found between the lumbar spine 1, 2, 3, 4 and total L1-L4 spines T scores.

Conclusion: There is no consensus in the literature on the effect of adolescent pregnancy on BMD and bone mass. The results of the studies differ from each other. Our study showed a statistically significant difference between the groups in the femoral T scores measured in BMD, but no difference was found between the lumbar T scores.

Keywords: Adolescent pregnancy, postmenopausal period, osteoporosis

INTRODUCTION

Adolescence is the life stage that begins at age ten and ends at age 19 (1). Adolescent pregnancy (AP) is a critical health problem. Adolescent pregnancies can lead to maternal and fetal complications such as low body mass, maternal anemia, hypertensive disorders, poor fetal growth and low birth weight of newborns worldwide (2).

In addition, there are studies stating that pregnancy and breastfeeding during adolescence may cause a decrease in postmenopausal bone mass (3). There is physiologically increased bone turnover and calcium release during pregnancy (4). Adolescent mothers may be at risk of irreversible bone loss during pregnancy and lactation, especially when calcium intake is low. However, it has been shown that this process can be stopped in pregnant women with calcium intake (5). Although the relationship between pregnancy and maternal bone mass has not been fully understood, it can be thought that, contrary to what is observed in menopause, there is an increase in bone mass due to increased osteoblastic activity during pregnancy (6). AP has a positive effect on peak bone mass. However, there are few research investigating the long-term effects of adolescent pregnancies on bone mass and quality, and their relationship has not been clarified.

Postmenopausal osteoporosis can cause osteoporotic fractures that cause severe mortality and morbidity worldwide (7). In our study, we studied the association between bone density in the postmenopausal period and AP.

MATERIAL AND METHOD

Our study was conducted at a tertiary public hospital, between December 2021 and December 2022. The study was initiated with the approval of the Adana City Training and Research Hospital Ethics Committee (Date: 15.12.2022, Decision No: 2319). All participants provided their written, informed permission. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Corresponding Author: Cevdet Adigüzel, cevdetadiguzel@yahoo.com
Received: 28.12.2022 **Accepted:** 27.01.2023

Our study included 70 women of postmenopausal age who visited the Obstetrics and Gynecology Outpatient Clinic. The participants were separated into two groups. Thirty-five women with a history of pregnancy in adolescence were considered group 1, and 35 women without a history of pregnancy were considered group 2. Patients using drugs that may affect bone mass, such as chemotherapy, heparin, bisphosphonates and lithium, and patients with a history of diseases affecting bone mass, such as chronic kidney, thyroid and parathyroid diseases and cancer, were excluded from the study.

The demographic data, body mass index (BMI), medical history, age of first menstruation, first delivery age, age of menopause, gravidity, parity, levels of serum 25-OH vitamin D and bone mineral densitometry (BMD) (in grams per square centimeter) scores were also recorded.

Using dual-energy x-ray absorptiometry, the BMD was evaluated at central skeletal locations (total hip, femoral neck, and lumbar spine) (DEXA). DEXA scans were conducted utilizing a Lunar Prodigy (GE Healthcare®) device.

The Shapiro-Wilk test was utilized to determine whether or not the continuous data followed a normal distribution. Continuous variables were summarized as mean±standard deviation when it provided the assumption of normal distribution and as median [25%-75%] if it did not. As numbers and percentages, categorical variables were summed up. The Mann-Whitney U test was used when the assumption of normality was not met in the comparison of two independent groups. When available, the Independent Sample t-test was utilized. Utilizing the Chi-square test, the connection between two category variables was examined. A binary ratio comparison was made for the significant relationship. When the expected frequency was less than 5, the Fisher-Exact test was utilized, and a p-value of 0.05 was considered statistically significant.

RESULTS

Thirty-five of the 70 postmenopausal patients included in the study had a history of AP, while the remaining 35 did not. **Table 1** summarizes the sociodemographic and obstetric features of the participants. The mean age (mean ±SD) of patients with a history of AP was 63,51±8,56 years, and the mean age (mean ±SD) of patients without a history of AP was 59±8,23 years. Patients with a history of AP had a mean body mass index (BMI) of 30.34±6.08 kg/m², and those without a history of AP had a mean BMI of 31.35±6.25 kg/m² respectively. Patients having a history of AP and those without a history of AP had median parities of 5 [4-6] and 3 [1-5], respectively. The median [25%-75%] gravida of patients with a history of AP and without a history of AP were 5 [4-6] and 3 [1-5], respectively. The median [25%-75%] age of first menstruation of patients with a history of AP was 13 [13-13] years, and the median [25%-75%] age of first menstruation of patients without a history of AP was 13 [11-17] years. The median [25%-75%] age of onset of menopause of patients with a history of AP was 50 [48-51] years, and the median [25%-75%] age of onset of menopause of patients without a history of AP was 48 [45-65] years. The median [25%-75%] first delivery age of patients with a history of AP was 23 [20-36] years, and the median [25%-75%] first delivery age of patients without a history of AP was 17 [16-18] years. There was no statistical difference between the groups in terms of demographic data such as age, BMI, age at first menstruation and age of onset of menopause. In contrast, education level, parity, gravida and first delivery age values showed statistically significant differences.

Table 1: The Sociodemographic and obstetric characteristics of the study participants

	With history of adolescent pregnancy (n=35)	Without history of adolescent pregnancy (n=35)	P
Maternal age (years) (mean ±SD)	63.51±8.56	59±8.23	0.028
Body mass index (kg/m²) (mean ±SD)	30.34±6.08	31.35±6.25	0.497
Education level (%)			<0.05
Illiterate	18 (51.5%)	6 (17.1%)	
Primary school	12 (34.3%)	14 (40%)	
High school	3 (8.6%)	5 (14.3%)	
University	2 (5.7%)	10 (28.6%)	
Gravida (median [25%-75%])	5 [4-6]	3 [1-5]	<0.001
Parity (median [25%-75%])	5 [4-6]	3 [1-5]	<0.001
Age of first menstruation (years) (median [25%-75%])	13 [13-13]	13 [11-17]	0.775
Age of onset of menopause (years) (median [25%-75%])	50 [48-51]	48 [45-65]	0.200
First delivery age (years) (median [25%-75%])	23 [20-36]	17 [16-18]	<0.001

A statistically significant difference was found between the femoral neck and total femoral T scores measured in BMD in patients with and without a history of AP (p=0.033, p=0.006, respectively). In addition, there was no statistically significant difference between the two groups lumbar spine 1, 2, 3, 4 and total L1-L4 spines T scores (p=0.489, p=0.210, p=0.499, p=0.518, and p=0.324, respectively) (**Table 2**.).

Table 2: BMD scan T-scores and serum vitamin D levels of women during postmenopausal period.

	With history of adolescent pregnancy (n=35)	Without history of adolescent pregnancy (n=35)	P
Lumbar spine 1 (mean±std)	-1.73±1.62	-1.49±1.19	0.489
Lumbar spine 2 (mean±std)	-2.12±1.83	-1.64±1.15	0.210
Lumbar spine 3 (median [25%-75%])	-1.4 [-3.1- -0.65]	-1.75 [2.42- -0.75]	0.499
Lumbar spine 4 (mean±std)	-1.7±1,75	-1.46±1,08	0.518
Lumbar spine 1-4 (median [25%-75%])	-2 [-3.1- -0.8]	-1.8 [-4.4-2]	0.324
Femoral neck (mean±std)	-1,71±1,08	-1,20±0,87	0.033
Total femoral (mean±std)	-1,39±1,11	-0,67±0,95	0.006
Vitamin D (ng/ml) (median [25%-75%])	15.3 [10.3-23.4]	20 [2.9-58]	0.318

DISCUSSION

The effect of pregnancy on bone mass is also unclear in the literature. While some studies report an insignificant loss of BMD during pregnancy (8,9), some studies report a 2-9% loss during pregnancy (10,11). However, another study noted that pregnancy-related changes in bone mass might be reversible (12). In both developed and developing nations, adolescent pregnancies pose a significant public health burden (13). Also, the effect of AP stories on bone mass is still controversial. Our objective is to investigate the association between bone density in the postmenopausal period and AP, gravida, parity, first delivery age, and multiple births and contribute to this controversial topic. Adolescence is a critical period in which about half of peak bone mass is achieved (14). Due to physiological adaptations designed to ensure adequate mineral transfer to the developing fetus and impending lactation, the bone mineral status is significantly altered during pregnancy (15). In a study examining the effect of parity on BMD after menopause, birth and breastfeeding were found to not influence bone density (16).

Numerous studies have demonstrated that AP has either positive or negative effects on BMD (4,6,17,18). One study suggested that AP may affect the physiological processes of bone metabolism and therefore adversely affect peak bone mass (16). Lloyd et al. (6) found that a history of AP had a modest negative effect on femoral bone mass but had no effect on whole-body bone mass. In another investigation, no statistically significant differences were detected when patients with and without AP were compared in terms of lumbar and femoral bone density. It was revealed that patients who gave birth twice throughout puberty had a 6.8-fold increased incidence of osteoporosis (3). In another study conducted in AP, there was no difference in bone mineral densities of the lumbar region. At the same time, there was a difference in bone mineral densities of the femoral neck. In our investigation, there was a statistically significant difference in favour of those with a history of AP between the femoral neck and total femoral T scores evaluated by BMD. In addition, the lumbar spine 1, 2, 3, 4 and total L1-L4 spine T scores did not differ substantially across groups.

Endocrine Society classifies serum 25(OH)D serum levels into three categories: 20 ng/ml indicates a deficiency, 20-29.9 ng/ml indicates insufficiency, and 30 ng/ml indicates appropriate levels (19). Vitamin D deficiency is common among postmenopausal women (20). In a study by Öcal et al. (21), which included pregnant women in the adolescent period, 25(OH)D serum levels were found to be sufficient in only 2% of the patients participating in the study. We did not find a statistically significant difference between the groups' 25(OH)D levels. The median values of both groups were below adequate levels at 15.3 and 20 ng/ml, respectively.

Osteoporosis is a multifactorial disease. Our study is a retrospective clinical study and does not have a study design that can establish a cause-effect relationship. It should be taken into account that other factors may impact postmenopausal BMD levels, such as the nutritional habits, sociocultural level, geographical location, and genetic heritage of the woman, as well as yet unknown. Other limitations of our study are that it is single-centre and the number of patients is relatively low.

CONCLUSION

There is no consensus in the literature on the effect of AP on BMD and bone mass. The fact that the results of the studies differed from each other suggests that the samples of these studies may have resulted from different patient populations and control groups. In our study, there was a statistically significant difference in femoral T scores determined by BMD but no difference in lumbar T scores.

There is no financial backing for the research, and the writers have no vested interests in the subject matter.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Health Sciences University Adana City Training and Research Hospital Ethics Committee (Date: 15.12.2022, Decision No: 118/2319).

Informed Consent: All participants provided their written, informed permission.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

REFERENCES

1. Singh JA, Siddiqi M, Parameshwar P, Chandra-Mouli V. World Health Organization guidance on ethical considerations in planning and reviewing research studies on sexual and reproductive health in adolescents. J Adolesc Health 2019; 64: 427-9.
2. Agampodi TC, Wickramasinghe ND, Jayakodi HG, et al. The hidden burden of adolescent pregnancies in rural Sri Lanka; findings of the Rajarata Pregnancy Cohort. BMC Pregnancy Childbirth 2021; 21: 494.
3. Kaya AE, Dogan O, Basbug A, Sonmez CI, Sungur MA, Ataoglu S. An Evaluation of the Association of Reproductive History and Multiple Births during Adolescence with Postmenopausal Osteoporosis. Geburtshilfe Frauenheilkd 2019; 79: 300-7.
4. Yuce T, Kalafat E, Koc A. Adolescent pregnancy; a determinant of bone mineral density in peri-menopausal women? Maturitas 2015; 82: 203-7.
5. Bezerra FF, Mendonca LM, Lobato EC, O'Brien KO, Donangelo CM. Bone mass is recovered from lactation to postweaning in adolescent mothers with low calcium intakes. Am J Clin Nutr 2004; 80: 1322-6.
6. Lloyd T, Lin HM, Eggli DF, Dodson WC, Demers LM, Legro RS. Adolescent Caucasian mothers have reduced adult hip bone density. Fertil Steril 2002; 77: 136-40.
7. Kanis JA, Cooper C, Rizzoli R, et al. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteoporos Int 2019; 30: 3-44.
8. Yumusakhuylu Y, Turgut ST, Icagasioglu A, et al. Bone mineral changes during pregnancy and lactation. Gynecol Endocrinol 2013; 29: 763-6.
9. Cross NA, Hillman LS, Allen SH, Krause GF, Vieira NE. Calcium homeostasis and bone metabolism during pregnancy, lactation, and postweaning: a longitudinal study. Am J Clin Nutr 1995; 61: 514-23.
10. Hellmeyer L, Ossendorf A, Ziller V, Tekesin I, Schmidt S, Hadji P. Quantitative ultrasonometry of the phalanges during pregnancy: a longitudinal study. Climacteric 2006; 9: 446-51.
11. Karlsson C, Obrant KJ, Karlsson M. Pregnancy and lactation confer reversible bone loss in humans. Osteoporos Int 2001; 12: 828-34.
12. Ensom MH, Liu PY, Stephenson MD. Effect of pregnancy on bone mineral density in healthy women. Obstet Gynecol Surv 2002; 57: 99-111.
13. Bryce J, Boschi-Pinto C, Shibuya K, Black RE, Group WHOCHER. WHO estimates of the causes of death in children. Lancet 2005; 365: 1147-52.
14. Bachrach LK. Hormonal Contraception and Bone Health in Adolescents. Front Endocrinol (Lausanne) 2020; 11: 603.
15. Salles JP. Bone metabolism during pregnancy. Ann Endocrinol (Paris) 2016; 77: 163-8.
16. Crandall CJ, Liu J, Cauley J, et al. Associations of Parity, Breastfeeding, and Fractures in the Women's Health Observational Study. Obstet Gynecol 2017; 130: 171-80.
17. Cho GJ, Shin JH, Yi KW, et al. Adolescent pregnancy is associated with osteoporosis in postmenopausal women. Menopause 2012; 19: 456-60.
18. Loro ML, Sayre J, Roe TF, Goran MI, Kaufman FR, Gilsanz V. Early identification of children predisposed to low peak bone mass and osteoporosis later in life. J Clin Endocrinol Metab 2000; 85: 3908-18.
19. Chauhan K, Shahrokhi M, Huecker MR. Vitamin D. StatPearls Treasure Island (FL)2022.
20. Suganthan N, Kumanan T, Kesavan V, Aravinthan M, Rajeshkannan N. Vitamin D status among postmenopausal osteoporotic women: a hospital based cross-sectional study from Northern Sri Lanka. BMC Nutr 2020; 6: 15.
21. Ocal DF, Aycan Z, Dagdeviren G, Kanbur N, Kucukozkan T, Derman O. Vitamin D deficiency in adolescent pregnancy and obstetric outcomes. Taiwan J Obstet Gynecol 2019; 58: 778-83.