

Effects Of Different Socioeconomic Conditions On Bone Mineral Density In Healthy Female College Students; Relation With Vitamin D Status

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BACKGROUND:

The age of attainment of peak bone mass is still disputed. According to some studies, peak bone mass occurs as early as 20 years of age. High peak bone mass in early life reduces fracture risk in later life. Dual-energy X-ray absorptiometry (DXA) has become the gold standard for assessment of bone mass.

Socioeconomic Status (SES) may play a role in the development of bone mass. It has been shown an association between SES and bone mineral density (BMD) in some adult studies, yet this association in late teen or young adults are need to be clarified.

Vitamin D status is currently considered among the relevant determinants of skeletal integrity. Some adult studies have shown that vitamin D increases BMD. Some studies from children and adolescents have reported that optimal vitamin D level is essential for attainment of peak bone mass as well.

Objective and hypotheses: The aim of the present study is to examine the effects of different socioeconomic conditions on BMD and vitamin D status in healthy female college students and to investigate the association between Vitamin D status and BMD.

PARTICIPANTS AND METHODS:

A total of 138 healthy girls at late adolescence period (mean age 20.13±0.93 years, range 18-22) were included in this university school-based cross-sectional study in the urban area western region of Turkey. Participants have been randomly selected to reflect the university students studying in all faculties. We asked relevant questions about socioeconomic and nutritional status to female university students. Students were grouped into three socioeconomic status as lower, middle and higher according to the educational and occupational levels of their parents using Hollingshead index (Table 1). Height and weight were measured. Body Mass Index (BMI) (kg/m²) was calculated. Serum samples for Vitamin D of all participants were collected in April and May (springtime). Total 25-hydroxyvitamin D has been assessed by electrochemiluminescence method on analyser by original reagents (Elecys 2010, Roche Diagnostics, GmbH Mannheim, Germany). Dual-energy X-ray absorptiometry (DXA) was performed using Lunar DPX series, IQMD. BMD (measured in grams per square centimeter) was calculated for the second, third, and fourth lumbar vertebrae and the total body.

Definitions: Osteopenia is defined as a BMD between 1 and 2.5 standard deviations (SDs) below the mean for healthy young adults. Adequate calcium intake is 1000 mg per day for young woman. Physical activity was assessed as regular or irregular.

Vitamin D deficiency is defined as a 25(OH)D below 20 ng/ml (50 nmol/liter), and vitamin D insufficiency as a 25(OH)D of 21–29 ng/ml (525–725 nmol/liter).

RESULTS:

According to the educational and occupational status of their parents, the students were included either in low (47.8%, n: 66), middle (29.7%, n: 41), or high (22.5%, n: 31) socioeconomic status (p=0.672). Participants' characteristics according to SES are shown in Table 2. There were no significant differences between weight, height, and BMI of female university students from different socioeconomic classes (p>0.05). No significant differences were found in terms of BMD values and z scores between three different socioeconomic status (p>0.05) (Table 2) (Figure 1). Similar result was obtained for Vitamin D level (Figure 2.).

Daily calcium intake was lower in females belonging low SES than those in middle and high SES. Significant difference was only found between females belonging low and middle SES (p=0.025).

Frequency of vitamin D deficiency was higher in females belonging low SES as well. However there was also no significant difference in this respect between groups (p=0.67) (Table 3). Frequency of osteopenia was significantly (p=0.02) higher in females belonging low SES. Similar statistical significant (p=0.02) results were obtained for frequency of inadequate daily calcium intake.

There was a weak correlation between BMD L2-L4 and weight (r=0.17, p=0.46). No significant correlations were found between BMD, Vitamin D levels and daily calcium intake. Physical activity levels of females were irregular.

Table 1. Participants' characteristics according to SES

Characteristics	Socio-economic status (SES)		
	Low (n:66)	Middle (n:41)	High (n:31)
Age (year)	19.8±0.9	20.36±0.93	20.5±0.7
Height (cm)	163.7±6.0	165.1±6.1	163.7±5.9
Weight (kg)	56.7±7.2	58.5±9.3	56.7±8.1
BMI (kg/m ²)	21.2±2.5	21.4±2.9	21.2±2.6
BMD z score (total body)	-0.28±1.0	1.1±0.07	1.1±0.05
BMD z score (L2-L4)	-0.52±1.0	1.1±0.12	1.0±0.1

BMD: Bone Mineral Density

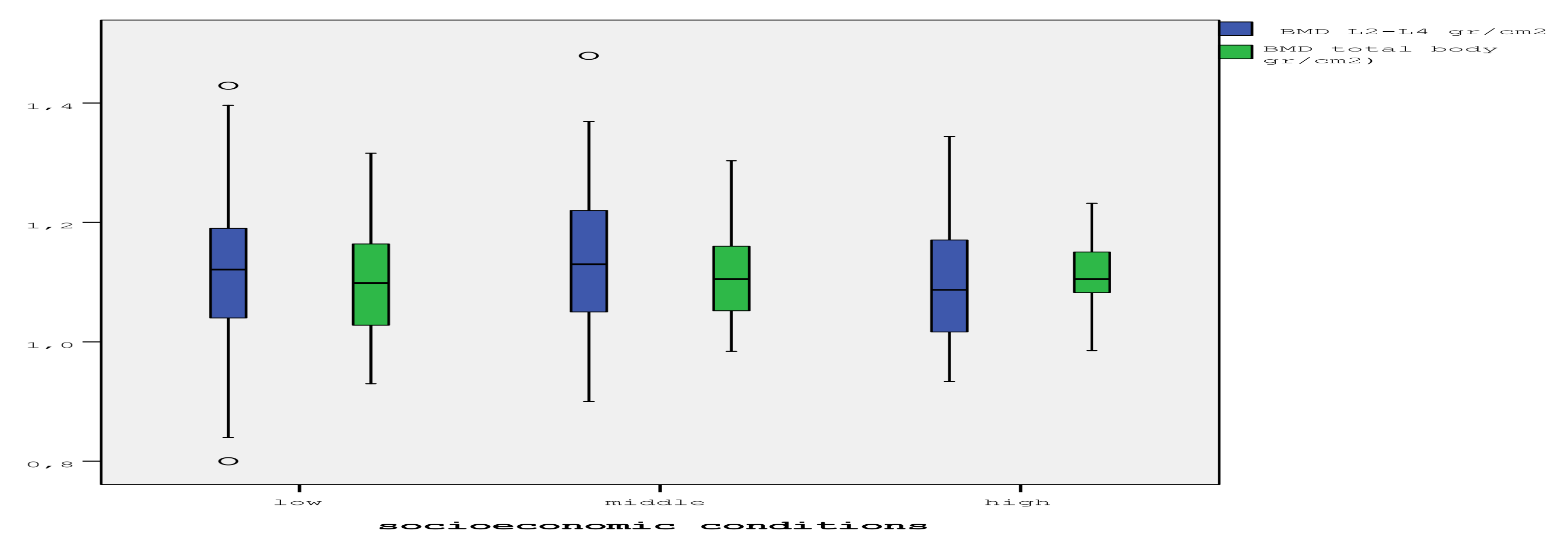


Figure 1. BMD values according to SES

Table 2. Percentage of osteopenia, Vitamin D deficiency and inadequate daily calcium intake according to SES in the subjects.

	Socio-economic status			Total (n:138)	p value
	Low (n:66)	Middle (n:41)	High (n:31)		
Frequency of osteopenia (%)	34.8	24.4	12.9	26.8	0.02*
Vitamin D deficiency (%)	31.8	24.4	28.6	28.9	0.67
Inadequate daily calcium intake (%)	98.4	82.5	87.1	91.1	0.02*

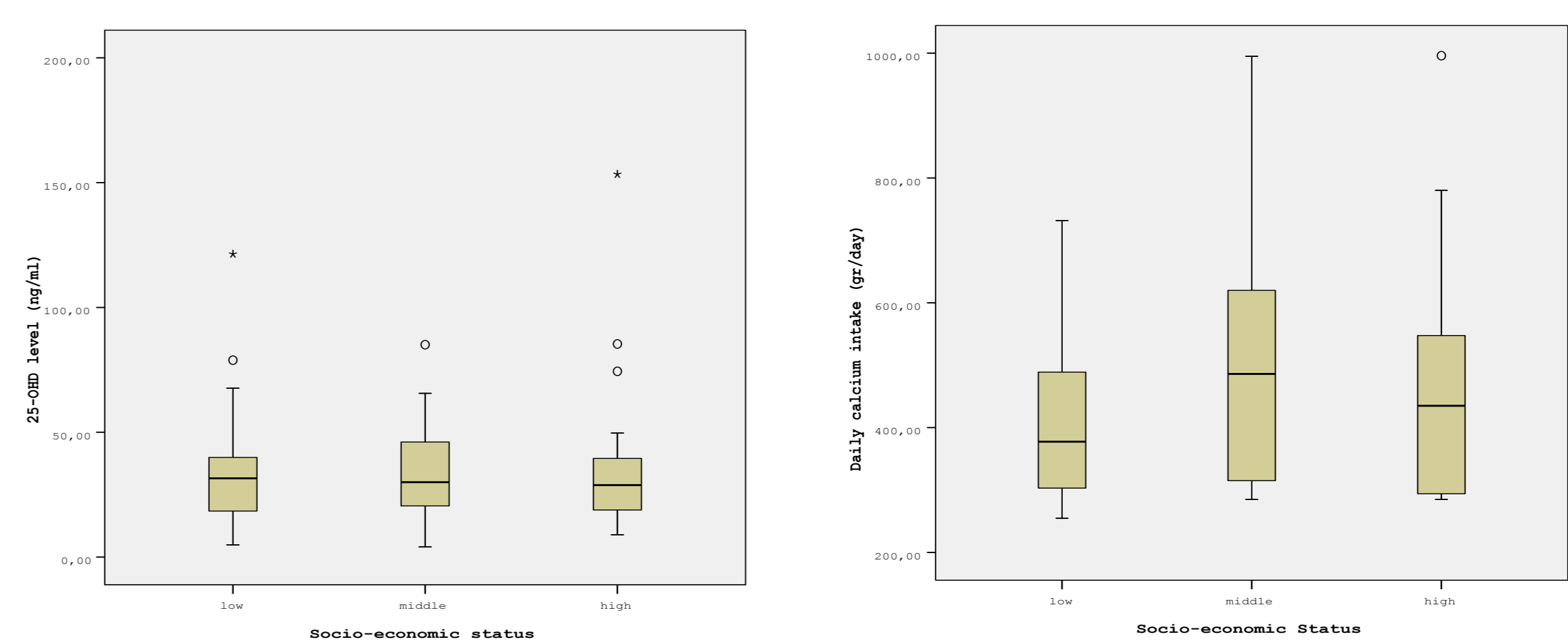


Figure 2. Vitamin D level and daily calcium intake according to SES.

CONCLUSION:

Vitamin D status and BMD levels showed no change according to SES in females at late adolescence. Our results suggest that the differences observed in socioeconomic status do not influence the vitamin D status and BMD in female university students. Majority of females of daily calcium intake were inadequate. Inadequate calcium intake is more common particularly in young females belonging low SES. Similarly, osteopenia is more common in same groups as well. However, BMD value is not related with vitamin D status and calcium intake in young females.

The authors declare that **there is no conflict of interest**

