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Letter to the Editor

Influence of Osteoporosis on Blood Lead Levels in Postmenopausal Korean Women

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Dear Editor-in-Chief

Osteoporosis is a significant global public health issue affecting over 200 million people worldwide and the prevalence of osteoporosis among women aged 50 and older ranges from 15.4% to 16.5% in the United States (1). Potential risk factors for osteoporosis encompass older age, low body mass index (BMI), cigarette smoking, and excessive alcohol consumption (2). Notably, estrogen deficiency is a substantial risk factor for osteoporosis in postmenopausal women (3). Among environmental pollutants, lead (Pb) is emerging as a significant risk factor for osteoporosis (4). Among adults, 80–95 % of retained Pb is stored in bone, with a half-life of approximately 20–30 years (5). These bone Pb deposits are released into the bloodstream during periods of heightened bone resorption, such as menopause, potentially serving as an endogenous source of Pb supply (6). Postmenopausal women face an elevated risk of bone Pb release due to hormonal and age-related alterations in bone metabolism. Hence, to evaluate the influence of osteoporosis on blood Pb levels in postmenopausal women, data including sociodemographic factors and blood Pb levels were extracted from the KNHANES 2016–2017 databases.

Of the 1,301 participants, the geometric mean blood Pb level was 1.76 μg/dL; the Pb concentration among postmenopausal women with osteoporosis was significantly lower than that among those without osteoporosis (P = 0.016) (Table 1).

Table 1: Geometric mean Pb [μg/dL (95% CI)] by the prevalence of osteoporosis in Korean women aged ≥ 50 years

Characteristics	*N*	*Osteoporosis group (N=281)*	*None osteoporosis group (N=1,020)*	*P-value**
Total	1301	1.68 (1.61–1.76)	1.79 (1.75–1.83)	0.016
Age (yr)				
50–59	528	1.56 (1.39–1.73)	1.77 (1.71–1.83)	0.024
60–69	409	1.69 (1.59–1.80)	1.80 (1.73–1.88)	0.112
≥ 70	364	1.72 (1.60–1.86)	1.81 (1.73–1.89)	0.294

**P*-Values from *t*-test for difference in geometric mean lead concentrations between groups

Participants with osteoporosis consistently had lower blood lead concentrations than those without osteoporosis across all age groups, with the most notable difference being the 50–59-year-old group which displayed a statistically significant difference ($P = 0.024$). The prevalence and ORs of osteoporosis demonstrated clear association with blood Pb levels. The OR for osteoporosis exhibited a significant decrease with increasing blood Pb concentration in both age-adjusted (Model 1) and fully-adjusted (Model 2) models (Table 2).

Table 2: Prevalences and adjusted odds ratios (95% CI) of osteoporosis by tertile of blood Pb in Korean women aged ≥ 50 years

Osteoporosis	*Tertile blood Pb level (μg/dL)*			*P for trend*
	Tertile 1 (< 1.50)	Tertile 2 (1.50–2.05)	Tertile 3 (> 2.05)	
Prevalence, %	23.6	22.3	18.9	0.099
OR (95% CI)*				
Model 1	1.00 (reference)	0.88 (0.58–1.33)	0.59 (0.38–0.91)	<0.001
Model 2	1.00 (reference)	0.87 (0.56–1.34)	0.55 (0.35–0.86)	<0.001

*Model 1: adjusted for age. Model 2: adjusted for age, BMI, education, income, cigarette smoking status, and alcohol drinking status

The relationship between osteoporosis and blood metal levels is complex and depends on various factors including age, sex, lifestyle habits, and race/ethnicity. Previous studies have reported that the association between blood Pb levels and bone mineral density is influenced by factors such as race and menopausal status (7). In osteoporosis, accelerated bone resorption releases stored metals like zinc, copper, and iron back into the bloodstream. This increase in circulating metals can ultimately lead to their enhanced excretion through urine, feces, and sweat, potentially lowering their blood concentrations (8). However, it is important to note that this effect may not be uniform for all metals, and further research is needed to fully understand the specific impacts of osteoporosis on individual metal levels.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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