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Poster 70

Environmental exposure to metal(loid)s: an emerging risk factor for osteoporosis in postmenopausal women?

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Abstract

Background: Osteoporosis is a major public health concern, particularly in the aging population, due to its association with increased fracture risk and reduced quality of life [1]. Although well-established risk factors contribute to bone mineral density (BMD) loss [2], environmental exposure to metals and metalloids is an emerging but underexplored determinant. **Objective:** To evaluate the association between exposure to metals and metalloids and osteoporosis in postmenopausal women aged 50 and older. **Methods:** This cross-sectional study included 380 postmenopausal women, aged 50–70 years, residing in Cascavel, Paraná, Brazil. BMD was measured using dual-energy X-ray absorptiometry. Urinary concentrations of 20 metals and metalloids ─ aluminium (Al), barium (Ba), cadmium (Cd), cobalt (Co), cesium (Cs), copper (Cu), mercury (Hg), lithium (Li), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), rubidium (Rb), antimony (Sb), selenium (Se), tin (Sn), strontium (Sr), thallium (Tl), uranium (U), and zinc (Zn) ─ were quantified using inductively coupled plasma mass spectrometry, and corrected for creatinine levels. Univariate and multiple regression analyses were used to investigate the association between metal(loid) exposure and BMD or osteoporosis risk. **Results:** A total of 73 women (19%) were diagnosed with osteoporosis. Univariate analysis revealed that urinary levels of Cd, Mn, Pb, Sb, Sn, and Zn were significantly increased in the osteoporosis group after adjustment for confounders ($p < 0.05$). Additionally, significant negative correlations were found between BMD and urinary levels of Al, Cd, Hg, Mn, Sb, and U after adjustment for confounders ($p < 0.05$). Higher urinary levels of Cd (OR = 1.495, 95% CI: 1.048; 2.131, $p = 0.026$), Mn (OR = 1.014, 95% CI: 1.001; 1.028, $p = 0.040$), Pb (OR = 1.016, 95% CI: 1.000; 1.033, $p = 0.048$) and Sb (OR = 2.059, 95% CI: 1.073; 3.950, $p = 0.030$) were independently and significantly associated with increased odds of osteoporosis. **Conclusions:** Our findings highlight a significant and clinically relevant association between environmental exposure to Cd or Sb and an increased risk of osteoporosis in postmenopausal women. Further longitudinal studies are essential to better understand the long-term effects of metal(loid) exposure on bone health, which could guide the development of targeted prevention strategies for osteoporosis.

Keywords: metals; metalloids; bone mineral density; women; aging; osteoporosis

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