Fragility Fracture Risk in U.S Postmenopausal Women: A Comprehensive NHANES Study

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Background: Fragility fractures significantly impact morbidity and mortality, especially among postmenopausal women. While osteoporosis is a key predictor, over 50% of fragility fractures occur without a densitometric diagnosis, suggesting a complex interplay of demographic and lifestyle factors. Evidence regarding the impact of physical activity and nutrition on bone structural integrity remains inconsistent, particularly at the population level.

Objectives: To assess the risk of osteoporosis and physical activity on fragility fracture and evaluate whether the relationship between physical activity and fracture risk is modified by obesity status among postmenopausal women.

Methods: This study analyzed data from 2007–2008, 2009–2010, 2013–2014, and 2017–2018 cycles of the National Health and Nutrition Examination Survey (NHANES), including 3,451 postmenopausal women (mean age: 65.1 years). The primary outcome was a history of fragility fracture (hip, wrist or spine), with osteoporosis status and physical activity as key predictors. Associations with fracture were examined using logistic regression models.

Results: Overall, 5.1% of US postmenopausal women reported a history of fragility fracture. The prevalence of osteoporosis was 27.4%, of which nearly one-third (31.4%) were previously unaware of their diagnosis. Fracture odds increased significantly with age (OR: 1.68, p=0.01) for ages 70–79; OR: 2.86, p<0.001 for ages 80+). Compared to NH-Black women, NH White women faced twice the risk (OR: 2.23, p=0.023). Notably, compared with women with normal bone health, fracture odds were higher for both self-reported osteoporosis (OR: 3.63, p <0.001) and those unaware of the diagnosis (OR: 2.53, p=0.002). Conversely, physical activity (150+ vs. ≤150 min/week, OR: 0.59, p=0.035) and Vitamin D intake (mcg) (OR: 0.94, p=0.042) were inversely associated with fracture.

Conclusions: These findings emphasize the necessity of proactive fracture prevention. Future strategies should prioritize expanded osteoporosis screening, targeted physical activity interventions, and inclusion of racial and ethnic disparities in clinical risk assessment models to improve long-term skeletal health.

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