

# Are Patients with Osteoporosis and a History of Hip Fracture Receiving Adequate Calcium and Vitamin D Supplementation?

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## INTRODUCTION:

Osteoporosis is a leading cause of mortality in older adults and its economic burden is expected to increase as our population lives longer. Calcium and vitamin D supplementation are essential in the management of this disease, as appropriate supplementation significantly reduces the risk of osteoporosis-related fractures and correlates with improved clinical and functional outcomes in postoperative hip fracture patients. However, the rate of adequate supplementation in the osteoporotic population remains unclear. The primary aim of this study is to determine the prevalence of adequate vitamin D and calcium supplementation among osteoporotic individuals, utilizing a national database. The second aim is to identify those patient factors associated with increased or decreased odds of adequate treatment.

## METHODS:

Six years of National Health and Nutrition Examination Survey (NHANES) data were queried to identify individuals self-reporting a diagnosis of osteoporosis. We analyzed dietary questionnaire and examination data among this population sample to determine calcium and vitamin D supplement intake, femoral neck bone mineral density (BMD), and prior incidence of hip fracture. Cut-off values for adequate daily supplementation were at least 1000 mg of calcium and 600 international units (IU) of vitamin D, which is consistent with the Institute of Medicine Dietary Reference Intake recommendations. Multivariable logistic regression was performed to assess for independent predictors of adequate calcium and vitamin D intake.

## RESULTS:

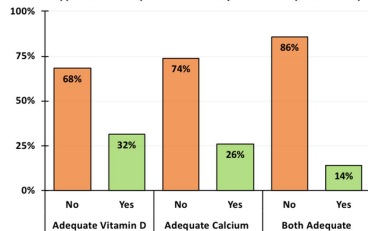
A total of 12,905 subjects who had completed survey elements of interest were included in the survey. Some 1,065 individuals were identified who self-reported a diagnosed of osteoporosis. In total, 924 patients (87%) were female with a mean age of 67 years old, and 861 patients (80.8%) with osteoporosis were not being treated appropriately with calcium and vitamin D. Fifty-eight patients were identified who had a history of both osteoporosis and hip fracture.

The following factors were associated with increased odds of adequate treatment for osteoporosis: female sex (OR 2.354,  $p < .001$ ), age (OR 1.019,  $p < .001$ ), Caucasian race (OR 1.456,  $p = .004$ ), and diagnosis of osteoporosis (OR 1.651,  $p < .001$ ). Mexican-American race (OR 0.658,  $p = .009$ ) was associated with decreased odds of adequate treatment for osteoporosis. History of hip fracture was not significantly correlated with adequate treatment of calcium and Vitamin D (OR 0.685,  $p = 0.176$ ) and subset analysis performed on patients with history osteoporosis and prior hip fracture shows that 14% of these individuals are being appropriately treated with calcium and vitamin D supplementation.

## DISCUSSION AND CONCLUSION:

While osteoporotic individuals are receiving calcium and vitamin D supplements at a higher rate than individuals without osteoporosis, our analysis of the NAHNES database indicates that the majority of patients with osteoporosis are not receiving adequate therapeutic supplementation. Furthermore, those patients with a diagnosis of osteoporosis and a history of hip fracture are receiving therapeutic supplementation at a rate of only 14%. Our analysis also indicate that older, Caucasian females have increased odds of correct supplementation, while non-Caucasian minorities have decreased odds. This study identifies important gender and racial disparities in adequate calcium and vitamin D supplementation

Chart 1: Supplementation in patients with history of both osteoporosis and hip fracture



	No Osteoporosis	Yes Osteoporosis	P-value
Gender	Column N (%)	Column N (%)	
Male	8,538 (65.9%)	348 (32.3%)	
Female	7,840 (60.1%)	524 (48.7%)	<0.001
Age	Mean	Mean	
60	67	67	0.903
Adequate Vitamin D			
Yes	13,956 (107.4%)	758 (71.2%)	
No	2,012 (15.4%)	307 (28.8%)	<0.001
Adequate Calcium			
Yes	9,645 (74.0%)	508 (47.6%)	
No	6,523 (50.4%)	523 (48.4%)	<0.001
Both adequate			
Yes	14,788 (114.0%)	863 (80.8%)	
No	1,182 (9.1%)	204 (19.2%)	<0.001
History hip fracture			
Yes	32,766 (253.7%)	1,065 (99.6%)	
No	708 (5.4%)	58 (5.4%)	<0.001
Femoral neck BMD (g/cm <sup>3</sup> ) Mean	0.893	0.876	<0.001
SD	0.1309	0.132	

## osteoporotic

	P-value	Odds Ratio	95% Confidence Interval
Female	<0.001	2.354	1.947-2.929
Age	<0.001	1.019	1.015-1.024
Race**	<0.001		
Mexican-American	0.009	0.658	0.481-0.901
Other Hispanic	0.137	0.777	0.558-1.083
White	0.004	1.456	1.324-1.606
Black	0.089	0.768	0.566-1.043
Femoral neck BMD (g/cm <sup>3</sup> )	0.952	1.016	0.834-1.241
Osteoporosis diagnosis	<0.001	1.651	1.351-2.015
Previous hip fracture	0.176	0.685	0.396-1.185

\*\* compared to other/multi-racial

## individuals.