Vitamin D Plus Calcium Supplementation for Fall Prevention: Short Review

Malak Hussain A Asiri[1]*, Abdulaziz Ayed A Alshahrani[2], Majed Mohammed S Alshehri[3], Abdulrahman Jawdat R Albalawi[3], Waleed Farhan D Alshammari[3], Jalawi Talal A Alotaibi[3], Anfal Atallah S Alamrani[3], Omar Mansour M Halawani[3], Aumniyat Saad A Alrashidi[3], Mohammed Ibrahim F Binibrahim[3]

[1]General Practitioner, Ministry of Health, Jeddah, Saudi Arabia.
[2]Medical Resident, King Abdullah Hospital Bisha, Saudi Arabia.
[3]Collage of Medicine, University of Tabuk, Saudi Arabia.

ABSTRACT

Falls are associated with significant morbidity and mortality among the elderly. Trials reported that supplementation of vitamin D plus calcium improves muscle strength and function, thereby reducing the risk of falls. EBSCO, Google Scholar, and Pub Med databases were searched for related articles using the terms vitamin D, falls, ergocalciferols, 25- hydroxyvitamin D, and 1, 25-dihydroxy vitamin D. Out of three hundred and four, only four completed the inclusion criteria. Co-administration of vitamin D and calcium protects against falls among the elderly. Among the elderly, vitamin D and calcium a successful fall reduction method.

Key Words: *Vitamin D, Calcium, Fall, 25- hydroxyvitamin*

eIJPPR 2021; 11(1):94-96

HOW TO CITE THIS ARTICLE: Asiri MHA, Alshahrani AAA, Alshehri MMS, Albalawi AJR, Alshammari WFD, Alotaibi JTA, et al. Vitamin D Plus Calcium Supplementation for Fall Prevention. Int J Pharm Phytopharmacol Res. 2021;11(1):94-6. https://doi.org/10.51847/IUFHXT3

INTRODUCTION

Among the elderly, falls are considered a very prevalent public-health problem (up to 30% in those aged 65 and more) [1, 2]. Morbidity and mortality among the elderly make fall-related fractures recognizable. Furthermore, it is considered the second cause of unintentional injury after road traffic injuries [3, ٤].

The elderly population may be at an increased risk of vitamin D deficiency due to limited exposure to sunlight and vitamin D-rich dietary intake. There are many negative outcomes associated with this [5, 6].

Several studies report an association between low vitamin D level and higher fall risk, a cross-sectional study conducted among 83 ambulant nursing home and hostel residents aimed to determine if low vitamin D is associated with increased risk of fall. The study concludes that falls were more recorded among those with low vitamin D [7, 8].

Furthermore, in 2004, a meta-analysis study showed a significant fall protective effect of vitamin D supplementation (800 IU/day) in combination with calcium (500-1200 mg/day), and this meta-analysis showed a reduction in the number of both falls and fallers [9].

The current review aimed to summarize vitamin D and calcium effects on falls among older adults [10-14].

MATERIALS AND METHODS

A systematic electronic search was conducted including Pub Med, Google Scholar, and EBSCO using the following terms in different combinations; falls, vitamin D, ergocalciferols, 25-hydroxy vitamin D, 1, 25-dihydroxy vitamin D, and calcium.

Randomized controlled trials in full text that assessed the effects of vitamin D plus calcium supplementation on risk of falls were included, while a study published in abstracts form only were not included.

Three hundred and four articles were identified. Only four of them fulfilled the inclusion and exclusion criteria. Independently, two authors screened the full texts and

Corresponding author: Malak Hussain A Asiri
Address: General Practitioner, Ministry of Health, Jeddah, Saudi Arabia.
E-mail: ✉ Mllak.4400@gmail.com
Received: 04 November 2020; **Revised:** 03 February 2021; **Accepted:** 12 February 2021

abstracts . The authors extracted the data, and then the author's names, year and region of publication, the study type, period of study, and the result were reported **(Table 1)**.

RESULTS AND DISCUSSION

Our literature search identified 304 records, 25 of which were reviewed as full-text articles for inclusion. After further exclusions based on our selection criteria, four articles provided sufficient information that was included in the current review. In total, these randomized controlled trials included 1111 older adults; Study sizes ranged from 122 to 445 participants, with the duration of follow-up ranging from 3 months to 36 months.

Table 1. Randomized control trials with summarizing the effect of vitamin D and calcium supplementation on reducing the risk of falls

Author–Year	Bischoff *et al.*[8] - 2003	Bischoff-Ferrari *et al.*[9] - 2006	Prince *et al.*[10] -2008	Pfeifer *et al.*[11] - 2009
Study design	Randomized controlled trial			
Therapy	1.2g calcium plus 800 IU cholecalciferol	Cholecalciferol (vitamin D3; 700 IU/d) plus calcium (500 mg/d)	Ergocalciferol, 1000 IU/d plus calcium citrate 1000 mg/d	1 g of calcium plus 800 IU of vitamin D per day
Follow-up duration	3 months	3 years	12 months	20 months
Total participants	122	445	302	242
Results	Number of falls reduced by 49% in the Interventional group	Cholecalciferol-calcium significantly reduced the odds of falling in women, but not in men	Ergocalciferol therapy reduced the risk of having at least 1 fall over 1 year	calcium plus vitamin D resulted in a significant decrease in the number of falls

Bischoff *et al*. conducted a randomized, double-blind trial among 122 elderly women, the participants were divided into two groups. The first group received 1.2g of calcium plus 800 IU cholecalciferol, while the other group received calcium alone. At the end of the treatment period (after 12 weeks), the study shows that vitamin D plus calcium supplementation resulted in a 49% fall reduction compared with calcium alone [15].

In 3 years, randomized, double-blind placebo-controlled trial, Bischoff-Ferrari *et al*., studied the role of cholecalciferol-calcium supplementation in fall prevention among males and females whose age was 65 years or older. The authors identified a statically significant fall reduction among elderly women only, regardless of baseline vitamin D level [16].

Another trial was conducted among women whose age range was from 70 to 90 years, with a low serum 25-hydroxyvitamin D level (less than 24.0 ng/mL) and a history of fall. Administration of ergocalciferol, 1000 IU/d plus calcium citrate,1000 mg/d resulted in 19% relative risk reduction [17].

In 20 months double-blind, controlled trial, Pfeifer *et al*. report that supplementation of calcium (1g) plus vitamin D resulted in a 39% reduction of the first fall [18].

The major randomized control trials (RCTs) that evaluate the effect of vitamin D and calcium supplements on fall reduction was summarized in this review. Many studies suggest that the risk of falls can be reduced with the supplementation of vitamin D plus calcium [15-18].

Vitamin D deficiency is common and its prevalence varies among the elderly. For illustration, the prevalence of hypovitaminosis D is estimated to be around 50% in non-fallers elderly and about 70% among fallers. Similarly, among institutionalized elderly with falls history, vitamin D levels were lower than those without a history of falls [7, 19].

Muscle weakness is one of the clinical ministrations of hypovitaminosis D. Fortunately, this weakness is reversible and improved with vitamin D supplementation. This beneficial effect of vitamin D on muscle strength could explain the positive result of vitamin D supplementation on falls reduction [18, 20].

CONCLUSION

Among the elderly, vitamin D at a minimum dose of 700 IU and calcium can result in fall reduction, especially if a vitamin D level is maintained at a concentration of at least 60 nmol/l.

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: None

REFERENCES

[1] Alzahrani MI, Alzahrani MI, Alsolami EA, Al Sulami AH, Abdulrahman A, Alhejaili MA, et al. Evaluative Role of Family Physician in Diagnosis and Management of Gout in Primary Health Care Centers: A Simple Literature Review. Arch Pharma Pract. 2019;10(3):126-9.

[2] Hanawi SA, Saat NZ, Zulkafly M, Hazlenah H, Taibukahn NH, Yoganathan D, et al. Impact of a Healthy Lifestyle on the Psychological Well-being of University Students. Int J Pharm Res Allied Sci. 2020;9(2):1-7.

[3] World Health Organization. Falls. Available from: http://www.who.int/mediacentre/factsheets/fs344/en/.

[4] Dargent-Molina P, Flavier F, Grandjean H, Baudoin C, Hausherr E, Meunier JP, et al. Fall-related factors and risk of hip fracture: The EPIDOS prospective study. Lancet. 1996;348(9021):145-9.

[5] Smith G, Wimalawansa SJ, Laillou A, Sophonneary P, Un S, Hong R, et al. High Prevalence of Vitamin D Deficiency in Cambodian Women: A Common Deficiency in a Sunny Country. Nutrients. 2016;8(5):290. doi:10.3390/nu8050290

[6] Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2011;96(7):1911-30.

[7] Stein MS, Wark JD, Scherer SC, Walton SL, Chick P, Di Carlantonio M, et al. Falls relate to vitamin D and parathyroid hormone in an Australian nursing home and hostel. J Am Geriatr Soc. 1999;47(10):1195-201.

[8] Thomas MK, Lloyd-Jones DM, Thadhani RI, Shaw AC, Deraska DJ, Kitch BT, et al. Hypovitaminosis D in medical inpatients. N Engl J Med. 1998;338(12):777-83.

[9] Bischoff-Ferrari HA, Dawson-Hughes B, Willet WC, Staehelin HB, Bazemore MG, Zee RY, et al. Effect of vitamin D on falls. JAMA. 2004;291:1999-2006.

[10] Korotaeva MS. The development of personal self-regulation of the cadets. J Adv Pharm Educ Res. 2021;11(1):91-104. doi:10.51847/YZIHyPh

[11] Al Meslamani AZ, Abdel-Qader DH, Albassam A, Ismael NS, El-Shara' AA, Lewis P, et al. Pharmacy students' knowledge and attitude of prescribing errors. J Adv Pharm Educ Res. 2021;11(1):105-13. doi:10.51847/cZFM36e

[12] Kalyanova LM. Lexical and grammatical difficulties the technical students face when translating texts on specialty. J Adv Pharm Educ Res. 2021;11(1):114-9. doi:10.51847/zCGSECt

[13] Atik N, Sururi MAR, Kartiwa RA. Comparison of TGF-β1 in corneal laceration with or without *Aloe vera* gel treatment. J Adv Pharm Educ Res. 2021;11(1):120-4. doi:10.51847/Jq2Ck35

[14] Abdulsahib WK, Abood SJ. The effect of Calcium channel blocker in the Betamethasone-induced Glaucoma model in rabbits. J Adv Pharm Educ Res. 2021;11(1):135-40. doi:10.51847/2d3w8vfSVt

[15] Bischoff H, Stähelin H, Dick W, Akos R, Knecht M, Salis C, et al. Effects of Vitamin D and Calcium Supplementation on Falls: A Randomized Controlled Trial. J Bone Miner Res. 2003;18(2):343-51.

[16] Bischoff-Ferrari H. Effect of Cholecalciferol Plus Calcium on Falling in Ambulatory Older Men and Women: A 3-Year Randomized Controlled Trial. Arch Int Med. 2006;166(4):424-30.

[17] Prince R. Effects of Ergocalciferol Added to Calcium on the Risk of Falls in Elderly High-Risk Women. Arch Int Med. 2008;168(1):103.

[18] Pfeifer M, Begerow B, Minne H, Suppan K, Fahrleitner-Pammer A, Dobnig H. Effects of a long-term vitamin D and calcium supplementation on falls and parameters of muscle function in community-dwelling older individuals. Osteoporos Int. 2008;20(2):315-22.

[19] Gloth MF, Tobin JD. Vitamin D deficiency in older people. J Am Geriatr Soc. 1995;43(7):822-8.

[20] Schott GD, Wills MR. Muscle weakness in osteomalacia. Lancet. 1976;307(7960):626-9.