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Original Research

Effect of calcium and vitamin D supplementation on bone density in men and women above 65 years of age

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ABSTRACT:
Background: Calcium is a key raw material for the laying down of bone. Together with phosphate, it makes up the mineral component of bone. The present study was conducted to assess effect of calcium and vitamin D supplementation on bone density in women above 65 years of age. **Materials & Methods:** 84 subjects above 65 years of age were divided into 2 groups. Group I received daily cholecalciferol 800 IU + calcium 1,000 mg and group II received neither supplementation nor placebo. BMD measurements were performed. Blood samples were obtained and serum 25 (OH) D was determined by radioimmunoassay method using 25(OH)D RIA kit.**Results:** Group I had 18 males and 24 females and group II had 22 males and 20 females. The mean weight (kg) was 71.2 and 70.5, height (cm) was 161.2 and 160.7, BMI (Kg/m2) was 27.4 and 27.1, age at menopause was 49.5 and 49.3, years since menopause was 18.5 and 18.4, use of calcium supplements was seen in 3 and 4, calcium/milk products (mg/day) was 924.6 and 984.2 and calcium total (mg/day) was 986.2 and 964.0 in group I and II respectively. The mean BMD ((g/cm2) at baseline at baseline inn group I was 1.061 and after 3 years was 1.078 and in group II was 1.072 and 1.074 after 3 years respectively. **Conclusion:** Combined daily cholecalciferol 800 IU and calcium has a positive effect on the skeleton in men & women above 65 years of age.
Key words: cholecalciferol, postmenopausal women, vitamin D

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INTRODUCTION

Serum levels of 25-hydroxyvitamin D (25 [OH] D) are directly related to bone mineral density (BMD). Calcium absorption decreases from digestive tract when 25 (OH) D levels are inadequate (<75 nmol/l). Accordingly, low 25 (OH) D leads to bone resorption and bone loss and thus increased risk of fracture. Vitamin D deficiency is common in the elderly since the capacity of the skin to synthesize provitamin decreases with age. Low vitamin D status is prevalent in elderly women living in northern latitudes, but this deficiency can also be detected in young adults in northern Europe and in the housebound elderly. It is believed that in order to achieve an optimal vitamin D level of >75 nmol/l one should consume between 800 and 1,000 IU of vitamin D everyday.[1]

Calcium is a key raw material for the laying down of bone. Together with phosphate, it makes up the mineral component of bone, which is laid down within the collagen scaffold constructed by the osteoblasts.[2] Calcium has other critically important physiological roles, particularly in nerve function, muscle contraction, the electrophysiology of the heart, intracellular signaling, and coagulation, so maintenance of a stable extracellular calcium concentration is a high homeostatic priority. Increasing calcium intake would only be expected to benefit bone health if calcium supply was a limiting factor impacting on either the density or architecture of bone.[3]

Vitamin D is a complex organic molecule derived from cholesterol. It is formed in human skin as a result of ultraviolet light exposure.[4]It is biologically inactive until hydroxylated at two sites. The activation of vitamin D is subject to precise homeostatic regulation since this is a key element of the regulation of circulating calcium levels. Activated vitamin D contributes to the maintenance of serum

calcium levels by increasing the absorption of calcium in the upper small bowel and by stimulating osteoclastic bone resorption.[5]The present study was conducted to assess effect of calcium and vitamin D supplementation on bone density in men &women above 65 years of age.

MATERIALS & METHODS

The present study comprised of 84 subjects above 65years of age of both genders. They were enrolled after they agreed to participate in the study. Data such as name, age, gender etc. was recorded. Group I received daily cholecalciferol 800 IU + calcium 1,000 mg and group II received neither supplementation nor placebo. BMD measurements were performed at the lumbar spine (L2–L4), left proximal femur, and total body with dual X ray absorptiometry twice. Parameters such as weight, height and BMI etc. were recorded. Blood samples were obtained and serum 25 (OH) D was determined by radioimmunoassay method using 25(OH)D RIA kit. Results were analysed statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Groups	Group I	Group II
Agent	cholecalciferol 800 IU + calcium 1,000 mg	placebo
M:F	18:24	22:20

Table I shows that group I had 18 males and 24 females and group II had 22 males and 20 females.

Table II Comparison of parameters

Groups	Group I	Group II	P value
Weight (kg)	71.2	70.5	0.12
Height (cm)	161.2	160.7	0.32
BMI (Kg/m^2)	27.4	27.1	0.51
Age at menopause (years)	49.5	49.3	0.60
Years since menopause	18.5	18.4	0.72
Use of calcium supplements	3	4	0.12
Calcium/milk products (mg/day)	924.6	984.2	0.95
Calcium total (mg/day)	986.2	964.0	0.91

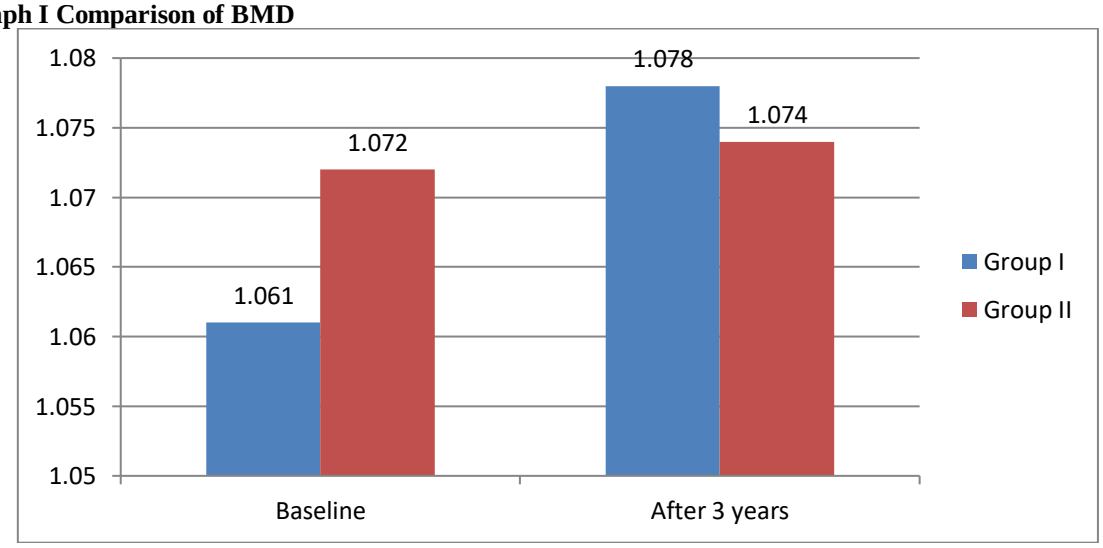
Table II shows that mean weight (kg) was 71.2 and 70.5, height (cm) was 161.2 and 160.7, BMI (Kg/m2) was 27.4 and 27.1, age at menopause was 49.5 and 49.3, years since menopause was 18.5 and 18.4, use of calcium supplements was seen in 3 and 4, calcium/milk products (mg/day) was 924.6 and 984.2 and calcium total (mg/day) was 986.2 and 964.0 in group I and II respectively. The difference was non- significant (P> 0.05).

Table III Comparison of BMD

Groups	Baseline	After 3 years	P value
Group I	1.061	1.078	0.01
Group II	1.072	1.074	0.15

Table III, graph I shows that mean BMD ((g/cm2) at baseline at baseline inn group I was 1.061 and after 3 years was 1.078 and in group II was 1.072 and 1.074 after 3 years respectively.

Graph I Comparison of BMD



DISCUSSION

The risk of hip fractures and other nonvertebral fractures increases in the elderly, reaching near-epidemic levels in many developed countries.[6,7] Although many factors contribute to such fractures, the most important causes are a reduction in bone mass and an increased frequency of falls. Bone density progressively decreases with age.[8] The decrease can be explained, at least in part, by increased parathyroid hormone secretion resulting from vitamin D deficiency and low calcium intake that are not compensated for by an increase in 1,25-dihydroxyvitamin D ($1,25(OH)_2D$) production.[9] Whether vitamin D or calcium supplements, or both, retard bone loss and reduce the rate of fractures among elderly people (those more than 70 years of age) is not known.[10,11]The present study was conducted to assess effect of calcium and vitamin D supplementation on bone density in men and women above 65 years of age.

We found that group I had 18 males and 24 females and group II had 22 males and 20 females. Group I received daily cholecalciferol 800 IU + calcium 1,000 mg and group II received neither supplementation nor placebo. KärkkäinenM et al[12] tested that vitamin D and calcium supplementation could prevent bone loss in ambulatory postmenopausal women. The OSTPRE-FPS was a randomized population based open trial with a 3-year follow-up in 3,432 women (aged 66 to 71 years). A randomly selected subsample of 593 subjects underwent BMD measurements. The supplementation group (n=287) received daily cholecalciferol 800 IU + calcium 1,000 mg for 3 years while the control group (n= 306) received neither supplementation nor placebo. Results In the intention-to-treat analysis, total body BMD (n= 362) increased significantly more in the intervention group than in the control group (0.84% vs. 0.19%, p=0.011). The BMD change differences at the lumbar spine (p=0.372), femoral neck (p=0.188), trochanter (p=0.085), and total proximal femur (p=0.070) were statistically non-significant. Analyses in compliant women (≥80% of use) resulted in stronger and statistically significant effects at the total body and femoral regions.

We found that mean weight (kg) was 71.2 and 70.5, height (cm) was 161.2 and 160.7, BMI (Kg/m2) was 27.4 and 27.1, age at menopause was 49.5 and 49.3, years since menopause was 18.5 and 18.4, use of calcium supplements was seen in 3 and 4, calcium/milk products (mg/day) was 924.6 and 984.2 and calcium total (mg/day) was 986.2 and 964.0 in group I and II respectively. Chapuy et al[13] studied the effects of supplementation with vitamin D3 (cholecalciferol) and calcium on the frequency of hip fractures and other nonvertebral fractures, identified radiologically, in 3270 healthy ambulatory women (mean [±SD] age, 84±6 years). Each day for 18 months, 1634 women received tricalcium phosphate (containing 1.2 g of elemental calcium) and 20 µg (800 IU) of vitamin D3, and 1636 women received a double placebo. Among the women who completed the 18-month study, the number of hip fractures was 43 percent lower (P = 0.043) and the total number of nonvertebral fractures was 32 percent lower (P = 0.015) among the women treated with vitamin D3 and calcium than among those who received placebo. The results of analyses according to active treatment and according to intention to treat were similar. In the vitamin D3—calcium group, the mean serum parathyroid hormone concentration had decreased by 44 percent from the base-line value at 18 months (P<0.001) and the serum 25(OH)D concentration had increased by 162 percent over the base-line value (P<0.001). The bone density of the proximal femur increased 2.7 percent in the vitamin D3—calcium group and decreased 4.6 percent in the placebo group (P<0.001).

We observed that mean BMD ((g/cm2) at baseline at baseline inn group I was 1.061 and after 3 years was 1.078 and in group II was 1.072 and 1.074 after 3 years respectively. Zhao[14] has recently meta-analyzed the 33 trials of calcium supplements in community-dwelling participants (n = 51,145) reporting fracture endpoints. Monotherapy with calcium tended to increase hip fracture risk and when combined with vitamin D was without effect. Calcium alone or with vitamin D is without effect on all other fracture endpoints. Outcomes were unrelated to gender, calcium dose, dietary calcium intake, or fracture history

CONCLUSION

Authors found that combined daily cholecalciferol 800 IU and calcium has a positive effect on the skeleton in men &women above 65 years of age.

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