

# Effect of Isolated and Combined Brisk Walking and Nutritional Supplements on Bone Mass Density and Serum Calcium Level among Post Menopausal Osteoporotic Women

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## Abstract

The purpose of the study was to find out the effect of isolated and combined brisk walking and nutritional supplements on Bone Mass Density and Serum Calcium level among post menopausal osteoporotic women. To achieve the purpose of the study sixty menopausal osteoporotic women were selected and they were divided into four equal groups. Experimental group I underwent brisk walking, Experimental group II underwent nutritional supplements, Experimental group III underwent combined brisk walking with nutritional supplements and control group was not exposed to any training. Brisk walking was given to the experimental group I for five days in a week for six weeks, Nutritional supplementation was given to the experimental group II for seven days in a week for six weeks and for group III both Nutritional supplementation and brisk walking was scheduled for six weeks. Pre-Test and Post-Test were conducted for Bone mass density and Serum calcium level. The significant difference between the means of experimental groups I, II, III and control group for the pre-test and post-test scores was determined by F-ratio through analysis of covariance (ANACOVA). The level of significance was fixed at 0.05 level of confidence. The result of the study reveals that the combined brisk walking with nutritional supplementation group showed greater improvement on bone mass density and serum calcium level.

**Key words:** Brisk walking, Nutritional supplement, Osteoporosis, Bone mass density and Serum calcium.

## Introduction

Since birth women are affected by several health issues which increase their mortality and morbidity. The common health issues include child birth, breast and uterine cancer, menopause, diabetes, obesity, osteoporosis, cardiac disorders, etc. Menopause is one of the important stage in women's life which leads to various physiological changes. Women reach menopausal stage between 40-50 years. Menopause is the permanent cessation of the menstrual periods that occur around age 50 years in most women. The postmenopausal phase is now recognised as a time of decreased hormonal production with associated problems that reduce the quality and length of life for a large number of women.

Postmenopausal women who walk about a mile each day have been found to have a higher bone density than women who do not. Walking is not only good for

the bones, but it's also good for the heart and it can reduce the risk of getting breast cancer. Nutrition science investigates the metabolic and physiological responses of the body to diet. With advances in the fields of molecular biology, biochemistry, and genetics, the study of nutrition is increasingly concerned with metabolism and metabolic pathways: the sequences of biochemical steps through which substances in living things change from one form to another (Gopalan, 2004)

Osteoporosis is one of the bone related disorder affecting mainly the old aged people as a result of which it influence the morbidity of the old people by causing fracture in the bone. Because of the sedentary life style osteoporosis has become more common among the early post menopausal women.

### **Purpose of the Study**

The following are the main objective of the study

1. To determine the effect of brisk walking on post menopausal osteoporotic women.
2. To determine the effect of nutritional supplement on post menopausal Osteoporotic women

### **Hypothesis**

The first Hypothesis states that the Experimental group I (Only walking), Experimental group II (only nutritional supplementation) and Experimental group III (combined walking with nutritional supplementation) would significantly improve Bone mass density than control group.

The second Hypothesis states that the Experimental group I (only walking), Experimental group II (only nutritional supplementation) and Experimental group III (combined walking with nutritional supplementation) would significantly increase serum calcium level than control group.

### **Review of Related Literatures**

Brooke-Wavell, Jones and Hardman, (1997) examined the influence of brisk walking on skeletal status in post-menopausal women. Subjects were 84 healthy women aged 60-70 years, Who were previously sedentary and at least 5 years post-menopausal. Subjects were randomly assigned to walking (n = 43) and control (n = 41) groups. Walkers followed a 12-month, largely unsupervised programme of brisk walking. The bone mineral density of the lumbar spine, femoral neck and calcaneus and broadband ultrasonic attention of the calcaneus were measured at baseline and after 12 months. Forty control subjects and 38 walkers completed

the study. Walkers built up to  $20.4 \pm 3.8$  min/day (mean  $\pm$  SD) of brisk walking. Body mass increased in control subjects relative to walkers [mean change (SE)  $+0.9$  ( $0.3$ ) and  $-0.1$  ( $0.3$ ) kg respectively;  $P = 0.04$ ]. Predicted maximum oxygen uptake increased in walkers by  $2.1$  ( $0.9$ ) ml min<sup>-1</sup> kg<sup>-1</sup> ( $P = 0.02$ ). Bone mineral density in the lumbar spine and calcaneus fell in control subjects [ $-0.005$  ( $0.004$ ) and  $-0.010$  ( $0.004$ ) g/cm<sup>2</sup>, respectively] but not in walkers [ $+0.006$  ( $0.004$ ) and  $+0.001$  ( $0.004$ ) g/cm<sup>2</sup>]. The difference in response between groups was significant in the calcaneus ( $P = 0.04$ ) but not in the lumbar spine ( $P = 0.08$ ). Mean femoral neck bone mineral density did not change significantly in either group, although changes in walkers were related to the amount of walking completed ( $r = 0.51$ ,  $P = 0.001$ ). The change in broadband ultrasonic attenuation of the calcaneus differed between groups [control subjects,  $-3.7$  ( $0.8$ ); walkers,  $-0.7$  ( $0.8$ ) dB/MHz;  $P = 0.01$ ]. Walking decreased bone loss in the calcaneus and possibly in the lumbar spine. It also improved functional capacity and enabled walkers to avoid the increase in body mass seen in control subjects.

Lanham-New (2008) conducted a study on Importance of calcium, vitamin D and vitamin K for osteoporosis prevention and treatment. It is now estimated that one in three women and one in twelve men aged >55 years will suffer from osteoporosis in their lifetime and at a cost in the UK of > 1.7 pounds x 10<sup>9</sup> per year. The pathogenesis of osteoporosis is multi factorial. Both the development of peak bone mass and the rate of bone loss are determined by key endogenous and exogenous factors. Calcium supplements appear to be effective in reducing bone loss in women late post menopause (>5 years post menopause), particularly in those with low habitual Ca intake (<400 mg/d). In women early post menopause (<5 years post menopause) who are not vitamin D deficient, Calcium supplementation has little effect on bone mineral density. However, supplementation with vitamin D and Calcium has been shown to reduce fracture rates in the institutionalized elderly, but there remains controversy as to whether supplementation is effective in reducing fracture in free-living populations. Redefining vitamin D requirements in the UK is needed since there is evidence of extensive hypo vitamin D in the UK. Low vitamin D status is associated with an increased risk of falling and a variety of other health outcomes and is an area that requires urgent attention. The role of other micronutrients on bone remains to be fully defined, although there are promising data in the literature for a clear link between vitamin K nutrition and skeletal integrity, including fracture reduction.

### Methodology

To facilitate the study, sixty post menopausal osteoporotic women, were selected at random as subjects and their age was between 50 to 55 years. They

were divided into four equal groups namely experimental group I (Brisk walking) Experimental group II (Nutritional Supplementation) Experimental group III (Combined Brisk Walking with Nutritional Supplementation) and control group. Brisk walking (5minutes warm up, 5 minutes , 20 minutes brisk walking) was given to the experimental group I for five days in a week for six weeks, Nutritional supplementation was given to the experimental group II on all days in a week for six weeks and while group III was given combined of the both (Nutritional supplementation and brisk walk) for six weeks.

Pre-Test and Post-Test were conducted for bone density (Single energy x-ray absorptiometry - a single x-ray beam was used to measure bone density at heel) and serum calcium level( was tested in lab using Beckman Synchron LX20 method) and data were recorded. The significance difference between the means of the experimental groups I, II,III and control group for the pre-test and post-test scores was determined by F-ratio through Analysis of Covariance. The level of significance was fixed at 0.05 level of confidence.

## Results and Discussions

Table I show that analysis of co-variance of pre-test, Post test and adjusted post- test on Bone mass Density of four groups.

**Table-I**

**Computational analysis of Co-variance of Pre-test, Post test and  
Adjusted Post- test on Bone mass Density of  
Four Groups  
(Scores in grams /cm<sup>2</sup> )**

Test	Ex. I	Ex. II	Ex. III	Control group	Sources of Variance	df	Sum of Squares	Means Squares	F Value
Pre-test	-2.69	-2.67	-2.65	-2.72	Between	3	1.23	0.41	0.83
					Within	56	27.59	0.49	
Post-test	-2.55	-2.52	-2.47	-2.67	Between	3	0.33	0.11	4.58*
					Within	56	1.34	0.02	
Adjusted Post-test	-2.55	-2.54	-2.47	-2.66	Between	3	0.29	0.10	4.63*
					With in	55	1.15	0.02	

\*Significant at 0.05 levels, confidence with df (3, 56) and df (3, 55) table F-value: 2.77

Table I shows that the obtained 'F' ratio value of 0.83 for pre test mean on bone mass density was not significant. It reveals that there was no



significant difference among experimental and control group on bone mass density before the commencement of training.

The 'F' ratio value 4.58 for post test data on bone mass density was significant at 0.05 level. The 'F' ratio of 4.63 for adjusted post test on bone mass density was significant at 0.05 level. It reveals that there was significant difference among the groups on bone mass density. The result of Scheffe's post hoc test was applied to find out the significance between the groups and presented in table II.

**Table - II**

**Scheffe's Post-Hoc Test for the Difference between Adjusted Post  
Test Paired Means of Bone mass Density for  
Four Experimental Groups  
(Scores in Grams / Cm<sup>2</sup>)**

<b>Ex. III</b>	<b>Ex. II</b>	<b>Ex. I</b>	<b>Control Group</b>	<b>MD</b>	<b>CI</b>
-2.47	-2.54			0.07	0.15
-2.47		-2.55		0.08	0.15
-2.47			-2.66	0.19*	0.15
	-2.54	-2.55		0.01	0.15
	-2.54		-2.66	0.12	0.15
		-2.55	-2.66	0.11	0.15

\*Significant at 0.05 level of Confidence

The table II shows that the paired mean difference between Experimental group III and Control Group was 0.19, which was greater than class interval value of 0.15. Hence the above comparison was significant. The mean differences between other pairs were insignificant.

**Figure - 1**

**Computation of Analysis of Co-Variance of Pre-Test, Post-Test  
and Adjusted Post-Test on Bone Mass  
Density of Four Groups  
(Scores in grams / cm<sup>2</sup>)**

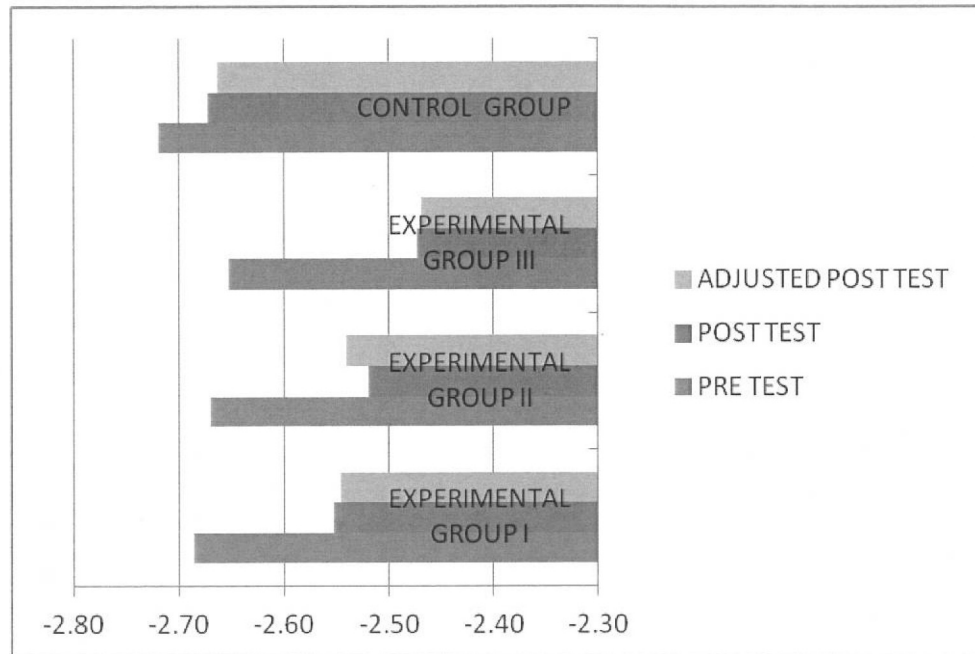


Table III shows Computation of Analysis of Co-Variance of Pre-Test, Post Test and Adjusted Post- Test on Serum Calcium level of Four Groups.

**Table - III**

**Computation of Analysis of Co-Variance of Pre-Test, Post Test  
and Adjusted Post- Test on Serum Calcium  
level of Four Groups  
(Mg/dl)**

Test	Ex. I	Ex. II	Ex. III	Control group	Sources of Variance	Df	Sum of Squares	Mean Squares	F Value
Pre-test	8.61	8.69	8.71	8.65	Between	3	0.08	0.03	2.19
					Within	56	0.64	0.01	
Post-test	8.70	8.84	8.96	8.67	Between	3	0.82	0.27	9.20*
					Within	56	1.67	0.03	
Adjusted Post-test	8.73	8.83	8.94	8.67	Between	3	0.57	0.19	7.07*
					Within	55	1.49	0.03	

\*Significant at 0.05 levels, confidence with df (3, 56) and df (3, 55) table F-value: 2.77

From the above Table III it was found that the obtained 'F' ratio value of 2.19 for pre test mean on serum calcium level was not significant. This shows that there was no significant difference among experimental and control group on serum calcium level before the commencement of training.

The 'F' ratio value of 9.20 for post test data on serum calcium level was significant at 0.05 level. The 'F' ratio of 7.07 for adjusted post test on serum calcium level was significant at 0.05 level. It reveals that there was significant difference among the groups on serum calcium level. The result of Scheffe's post hoc test applied to find out the means of serum calcium level among four groups was presented in table IV.

**Table - IV**

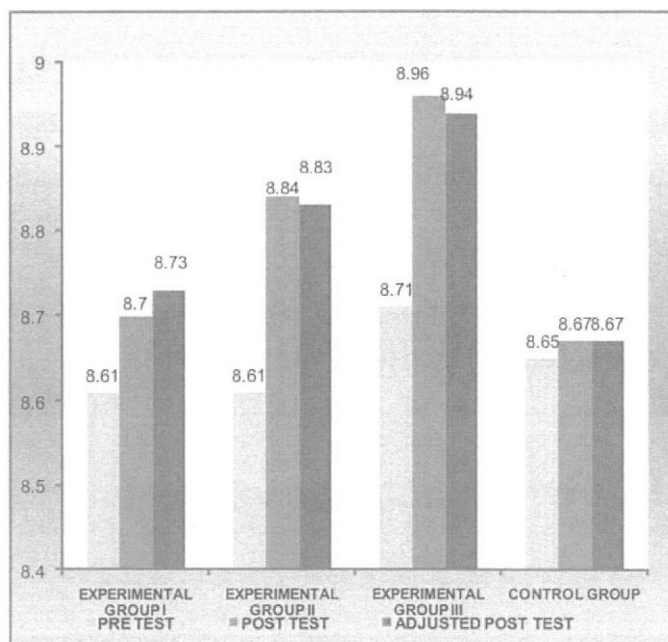
**Scheffe's Post-Hoc Test for the Difference between Adjusted Post Test Paired Means of Serum Calcium level for Four Experimental Groups (Mg/dl)**

Ex. III	Ex. II	Ex. I	Control Group	MD	CI
8.94	8.83			0.11	0.17
8.94		8.73		0.21*	0.17
8.94			8.67	0.27*	0.17
	8.83	8.73		0.1	0.17
	8.83		8.67	0.16	0.17
		8.73	8.67	0.06	0.17

\*Significant at 0.05 level of Confidence

The table IV shows that the mean difference between the Experimental group III and Experimental group I was greater than class interval of 0.17. The mean difference between the Experimental group III and Control group was greater than class interval of 0.17. Hence the above comparison was significant. The mean differences between other pairs were insignificant.

**Figure - 2**  
**Computation of Analysis of Co-Variance of Pre-Test, Post-Test and**  
**Adjusted Post-Test on Serum Calcium lev of Four Groups**  
**(Mg/dl)**



### Conclusions

1. The results of the study clearly shows that Walking group, Nutritional supplementation group and Walking with Nutritional supplementation group have significant improvement on the Bone mass density of postmenopausal women when compared to control group.
2. The outcome of the study shows that the Serum calcium level was improved among the Walking group, Nutritional supplementation group and Walking with Nutritional supplementation group than control group. Serum calcium level had improved better in Walking with Nutritional supplementation group than other groups.
3. Hence postmenopausal women can be suggested to undergo brisk walking and to have calcium rich nutritional supplement in their diet, which will improve the bone mass density and serum calcium level which enables to prevent fractures and other morbidity conditions.

## References

- Brooke-Wavell K, Jones PR, Hardman AE, (1997), Brisk walking reduces calcaneal bone loss in post-menopausal women". Clinical science, 92(1), PP 75-80.
- Gopalan,C. (2004), Nutritive value of Indian foods National Institute of Nutrition ICMR, Hyderabad, PP 2-3.
- Harrison (2004), "Text Book of Internal Medicine", New Delhi: Raghav Publications, P.1921.
- Lanham-New SA. Importance of calcium, vitamin D and vitamin K for osteoporosis prevention and treatment. Journals of Nutrition Society of India,67(2),PP163-76.
- McArdle, William .D et al (1991), Exercise Physiology, Energy Nutrition Human Performance", Philadelphia : Lea & Febiger, P. 441.

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