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## A study to find the effect of weight-bearing exercise on the bone mineral density in the osteoporotic femur in postmenopausal women

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### ABSTRACT

Osteoporosis is the systemic bone disease in which there is a slow decline in the mass of bone and there is the destruction of the microarchitecture of the tissue in the bone. In the world, this disease has today affected more than 2,000 million people. This study intends to find the effect of weight-bearing exercise to improve the functional mobility in the osteoporotic postmenopausal women. This study will take the post-treatment and pretreatment DEXA to find the role of weight-bearing exercise in increasing the bone mineral density. The study was done in OPD of saveetha medical college and hospital. The total number of sample in the study were 80 women's. The study design is a quasi-experimental study design. The convenient sampling was used. The inclusion and the exclusion criteria were fixed for the selection of the sample. The selected sample was allocated into two groups in which one group was an experimental group which received weight-bearing exercise, and the control group received the non-weight bearing exercise. The DEXA was done before and after treatment to find BMD. The outcomes were statistically analysed. The weight bearing exercise showed a better result in the experimental group than the control group. Post-treatment we could find there was a rise in the BMD. The study clearly shows that there is an increase in mobility after weight-bearing exercise. We strongly recommend the weight-bearing exercise in post-menopausal women to increase the bone mineral density.



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### INTRODUCTION

The Osteoporosis which is a systemic bone disease which causes a slow reduction in the bone mass and also reduces the microarchitecture of the bone tissue. The bone formation is reduced, and there is bone degradation which is taking place in this disease this, in turn, will cause the bones to become

weaker and can cause fracture and any bony pathology among the post-menopausal women. The rate of fracture among such women will be higher than the other normal women's (Nikander R *et al.*, 2010). When we look at the world statistics about the prevalence of this disease, we found that this has affected more than 2000 million people (Kanis JA *et al.*, 2008). The common problem which is faced by the osteoporotic women is the risk of fracture, and due to the reduction in the bone mass there will be a reduction in the balance, and there will be body sway (Sinaki M *et al.*, 2005). The women who have the fracture will be affected emotionally and physically as the living standard will decrease due to this, they will be dependent on the others for their daily activity, the family will face the economic issues as the treatment cost will increase, so this disease affects the life of the women in many patterns (Cumming SR, Melton LJ, 2002). The previous study on this issue has suggested us

that the strength training was given to this woman to increase the bone mineral density (Rikli RE, Mc Manis BG, 1990; Ryan AS *et al.*, 1994; Maimoum L *et al.*, 2003). As the earlier literature suggest this improvement in the bone mineral density is due to the piezoelectric effect of the bone which causes the increase in the bone mineral density. As the aging occurs there is a decline in the quality of the life which can also be improved by the exercise (Ekwall A, Lindberg A, Magnusson M, 2009). The main principle behind the weight-bearing exercise is that this causes the movement of the distal segment which is fixed or stabilized on the surface with support and this will cause the movement of both the distal and proximal joint (Escamilla RF *et al.*, 1998). In the non-weight bearing exercise the distal segment is not fixed (Rehabilitation techniques in the sports medicine, 3<sup>rd</sup> edition, 1999). The weight bearing exercise will activate both the agonist and the antagonist and helps to increase the stability by increasing the proprioceptive and kinesthetic feedback. The weight bearing exercise will cause a gradual increase in the stress which will speed the osteogenesis process. The Dual X-ray Absorptiometry (DEXA) is the most reliable tool for the examination of the bone mineral density in the femur and the spine. This will help us to intervene the condition in the very early stage and help the patient to diagnose the bone mineral density in the bone.

#### AIM OF THE STUDY

This study intends to find the effect of the weight-bearing exercise to improve functional mobility in osteoporotic postmenopausal women. This study also intends to find the post-treatment DEXA to find the impact of exercise on the bone mineral density.

#### MATERIALS AND METHODS

The study was done in OPD of saveetha medical college and hospital. The total number of sample in the study were 80 women's. The study design is a quasi-experimental study design. The duration of the study was for six months. The convenient sampling was used. The samples were selected based on inclusion and exclusion criteria. The inclusion criteria included postmenopausal women with osteoporosis of the femur, the BMI should not be higher than 30kg/m<sup>2</sup>, No history of fracture, No history of any surgery like hip replacement, screws etc. the exclusion criteria for the samples was any history of congenital deformity of the femur, history of Hip surgery, history of smoking and alcohol, any history of liver and kidney disease. The samples were given the informed consent form and were explained about the procedure in brief. The selected samples were randomly divided into two, i.e. the experimental group and the control group.

The experimental group was given with the weight-bearing exercise, and the control group received the non-weight bearing exercise. The experimental group received weight-bearing exercise for 40 minutes with a break of 5 minutes in between the exercise. The exercise includes the leg press in horizontal for 15 minutes, bicycling for 15 minutes, stair climbing for 10 minutes. And the control group received the non-weight bearing exercise which includes for 40 minutes with 10 minutes of break in between the exercise. The exercise includes straight leg raise, hip shrugging, and hip extension from the prone lying, abduction and adduction from the side lying. If the patients had any sensation of loss of balance, giddiness, excessive sweating, breathlessness then the patient was not allowed to continue the exercise for that session. The DEXA scan was done before and after the treatment to find the bone mineral density. The data was collected and was statistically analyzed.

#### RESULTS

The data of the pre and post-DEXA was collected. The bone mineral density was measured and was statistically analyzed. The bone mineral density was put to subjective analysis between the two groups which was based on the paired T-test. The experimental group showed a better result than the control group. There was a clear picture that the BMD has increased significantly ( $P < 0.0001$ ) in the experimental group and insignificantly in the control group ( $P > 0.05$ ). The result tells us that the weight-bearing exercise has caused the increase in the BMD.

#### DISCUSSION

The study was done to study the effect of weight-bearing versus non-weight bearing exercise on the bone mineral density in the osteoporosis in the postmenopausal women. In both, the exercise given to the postmenopausal women the closed kinematic exercise showed a better effect than open kinematic chain exercise. ( $P < 0.0001$ ). The earlier studies have also demonstrated that the weight-bearing exercise will improve the bone repair. The results are also the same as earlier found by Vincent *et al.* that the high-intensity exercise has a better result than the low-intensity exercise. De Sure *et al.*, have also found that regular exercise will improve the strength, balance, and gait. The osteoporotic menopausal women should be given the weight-bearing exercise so that they have an increase in the bone mineral density which will increase the mobility and reduce the risk of fall and fracture among the women. Hence this study supports that this exercise should be included in the rehabilitation schedule of the osteoporosis.

**Table 1: Estimation of bone mineral density**

Group		Pre treatment	Post treatment	Mean difference	Improvement (%)
Experimental group	Mean	-2.8	-2.3	-0.5	16%
	Standard deviation	-0.2	-0.5		
Control Group	Mean	-2.8	-2.8	-0.1	4.7%
	Standard deviation	-0.2	-0.3		

**CONCLUSION**

This study which intends to show the effectiveness of weight-bearing exercise in osteoporotic postmenopausal women shows that there is an increase in the bone mineral density. Hence we strongly recommend the closed kinematic chain exercise to decrease the risk of fall and increase the functional mobility in the osteoporotic female.

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