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IMPACT OF FUNCTIONAL STRENGTH TRAINING ON SELECTED BODY COMPOSITION PARAMETERS AMONG MEN WITH OSTEOPENIA

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ABSTRACT

For the purpose of the study was to examine the impact of functional strength training on selected body composition parameters among men with Osteopenia. The cross-sectional investigation of bone health and nutrition a total of 165 male aged 50-60 years were selected from Salem and surrounding communities. The screening of body composition was carried out at shri Gokulam Hospital by using DEXA scan; among 165 male 88 male are having osteopenia. From this 88 male 20 male Osteopenia subjects were randomly selected. The subjects were assigned into two group's namely experimental group I (functional strength Training) and group II acted as control group. The study was formulated as a true random group design consisting of pre - test and post –test. The experimental group participated in their training for a period of 12 weeks. Initial test were conducted for all the subjects on selected body composition parameters like Fat Mass, Lean Mass and Bone Mineral Density by using Dual-Energy X-ray Absorptiometry (DXA, DPX-NT, NT+73679 GE LUNAR MEDICAL SYSTEM) of the Whole Body scan. The post test is conducted on the above said parameters after the 12 weeks for the two groups. The results proved that there was a significant reduction in fat mass and significant improvement in lean body mass and bone mineral density among men with Osteopenia.

KEYWORDS:*Osteopenia, Fat Mass, Lean Mass and Bone Mineral Density.*

INTRODUCTION

Men do not realize that the 'silent epidemic' of osteoporosis affects them and their bones are becoming thinner and more porous and frail during adult life (Bindu et al, 2010).

Bone mass achieved during growth to young adulthood is lost just under half over a man's lifetime. The loss of bone is the same as the quantity lost in women but men compensate better by placing down more new bone on the exterior surface of the bone as part of the natural process of bone remodeling (Seeman, 1995). However, this addition of new bone on the exterior surface does not completely compensate for the loss of bone in inside surface and so one in five men over 50 years will have a bone fracture that decreases the quality of their lives, and lessens the length of their lives (poor,1995).

The risk factors are similar, such as: age, gender, menopause, having a family history, low body weight i.e. being small and thin, medical

history, not getting enough calcium and Vitamin D, not eating enough fruits and vegetables, having a diet high in protein, sodium and caffeine, long-term sedentary lifestyle, smoking, excessive alcohol consumption and delayed puberty in male (Chestnut,1994).

PHYSICAL ACTIVITY AND OSTEOPOROSIS

Physical activity is clinically accepted as a beneficial activity for osteoporotic patients, although little information exists regarding the best and most appropriate type, duration and intensity of exercise to provide the maximum protective effect against bone loss (Bass et al, 1998; Chilibeck, 1995). The exercise pattern should be analyzed according to the type of training, intensity, frequency and duration of each period. Most of the researches are in general on post-menopausal women. There exist just a few studies which include men (Bailey and Brooke-Wavel, 2008).

Physical activity is a very important factor in skeletal development and can prevent and treat age-related reductions in bone strength due to the inherent sensitivity to mechanical loading in bone tissue. When the skeleton is exposed to altered levels and patterns of mechanical loading the bone tissue responds by an adaptive mechanism called the mechanostat hypothesis, by analogy with a thermostat, based on "Wolff's Law"(Frost 1987,1998).

The skeleton must be as strong and flexible as possible to prevent fracture when the environmental demands increase and at the same time as light as possible to facilitate mobility (Seeman 2006). Perhaps the most convincing evidence that mechanical loading is important for bone adaptation comes from studies of the skeleton put in a state of disuse, i.e. bed rest, spaceflight or spinal cord injury. These studies demonstrate that bone loss is rapid and large when mechanical loading forces acting on the bone tissue are remarkably reduced (Giangregorio & Blimkie 2002). Also, the consistent effectiveness of exercise to increase bone mass, or at least arrest the loss of bone mass (Borer 2005).

FUNCTIONAL STRENGTH TRAINING ON BONE MASS

Functional strength training is the practice of motion against resistance, with an objective of improving a participant's ability to perform a specific athletic activity (Reynolds, M. 2003). Functional fitness has been defined by (Brill 2008) as emphasizing multiple muscle and joint activities, combining upper body and lower body movements, and utilizing more of the body in each movement. Functional strength training as a form of exercise gets little to no attention compared to cardiovascular training. Most people know that walking or riding their bike is an essential part of maintaining good health. A study by (de Vreede 2005) involving a group of elderly women demonstrated that functional task exercises were more effective than resistance exercises at improving functional task performance. These results suggested that functional task exercises play an important role in maintaining an independent lifestyle.

The skeleton must be as strong and flexible as possible to prevent fracture when the environmental demands increase and at the same time as light as possible to facilitate mobility (Seeman 2006). The roles of strength training on bone mineral density in men have obtained combined results. Few studies evaluated increased mineralization while others reported demineralization. But still functional strength training is the best way to increase bone mineral density among men with osteopenia in preventing bone loss (Hinton, Nigh, & Thyfault, 2015, Nelson et al, 1994). Training directed towards lower extremity and balance may reduce the risk of falling in osteopenia. This training will mechanically load the bone and evoked reflexive muscle contractions. Resistance training studies suggested that muscle contraction can also increase bone mineral density by stimulating tissue remodeling (Pruitt et al., 1992),bone formation (Menkes et al., 1993),or even augmentation of bone formation associated with an inhibition of reabsorption (Andreoli et al., 2001). Thus, functional strength training should be recommended as an adjunct lifestyle approach to osteoporosis prevention or in combination with other treatments in this group of women.

METHODOLOGY

For the purpose of the cross-sectional investigation of bone health and nutrition a total of 165 male aged

50-60 years were selected from Salem and surrounding communities. The screening of body composition was carried out at shri Gokulam Hospital by using DEXA scan; among 165 male 88 male are having osteopenia. From this 88 male 20 male Osteopenia subjects were randomly selected. The subjects were assigned into two group's namely experimental group I (Aerobic exercise with functional strength Training) and group II acted as control group. The study was formulated as a true random group design consisting of pre - test and post –test. Initial test were conducted for all the subjects on selected body composition parameters like Fat Mass, Lean Mass and Bone Mineral Density. The experimental group participated in their training for a period of 12 weeks. The post test is conducted on the above said parameters after the 12 weeks for the two groups. The functional strength training program is scheduled at 6.30 am to 7.30 am on alternate days.

As per the recommends ACSM the older adults perform 10 – 15 reps of 8-10 exercise that maintains muscle strength or endurance (Nelson et al, 2007). In general, progressive weight training for 25 minutes at 50-80% of maximum heart rate is recommended for older adults to develop muscle mass. Large muscle group functional strength training should be 25 minutes, small muscle group strength training for 10 min using Phyio ball, Theraband and abdominal strength training for 5 minutes considered to be a safe and effective method for increasing strength and lean muscle tissue, and attenuating age-related muscle loss (Metcalf et al, 2001; Reeves et al, 1985; Vincent et al., 2002; Roth et al., 2000).

RESULT AND DISCUSSION

Table – I

Test	Training Group	Control Group	SV	SS	df	MS	F
Pre Test	24.26	23.12	Between	6.56	1	6.555	0.33
			Within	362.38	18	20.13	
Post Test	19.26	23.55	Between	92.21	1	92.21	**4.99***
			Within	332.79	18	18.49	
Adjusted	18.75	24.06	Between	138.29	1	138.29	**47.25***
			Within	49.76	17	2.93	
Mean Gain	5.00	-0.44					

Table F- ratio at 0.05 level of confidence for 1 and 18 (df) = 4.41, 2 and 17 (df) = 4.45 *Significant.

Table I shows that the obtained F value on pre test scores on Fat mass was 0.33 lesser than the required value of 4.41 to be significant at 0.05 level. This proved there is no significant difference between the groups at initial stage and the randomizations at the initial stage are equal. The obtained post test F value of 4.99 was greater than the required F value of 4.41. Further, the obtained adjusted post test F value of 47.25 was greater than the required F value of 4.45. Hence, it was proved that the functional strength training significantly improved fat mass among men with osteopenia.

Figure-1
Bar Diagram showing the pre and post test mean on Fat Mass

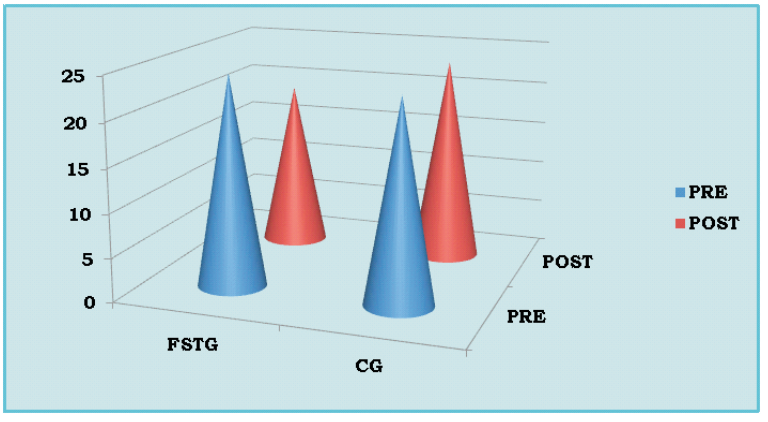


Table – II
Computation of Analysis of Covariance on Lean Mass

Test	Training Group	Control Group	SV	SS	df	MS	F
Pre Test	40.64	40.32	Between	0.51	1	0.512	0.03
			Within	290.96	18	16.16	
Post Test	44.22	40.36	Between	74.50	1	74.50	**4.95***
			Within	270.68	18	15.04	
Adjusted	44.07	40.51	Between	63.36	1	63.36	**54.21***
			Within	19.87	17	1.17	
Mean Gain	3.58	0.04					

Table F- ratio at 0.05 level of confidence for 1 and 18 (df) = 4.41, 2 and 17 (df) = 4.45 *Significant.

Table II shows that the obtained F value on pre test scores on Lean body mass was 0.03 less than the required value of 4.41 to be significant at0.05 level. This proved there is no significant difference between the groups at initial stage and the randomizations at the initial stage are equal. The obtained post test F value of 4.95 was greater than the required F value of 4.41. Further, the obtained adjusted post test F value of 54.21 was greater than the required F value of 4.45. Hence, it was proved that the functional strength training significantly improved lean body mass among men with osteopenia.

Figure-2
Bar Diagram showing the pre and post test mean on Lean Body Mass

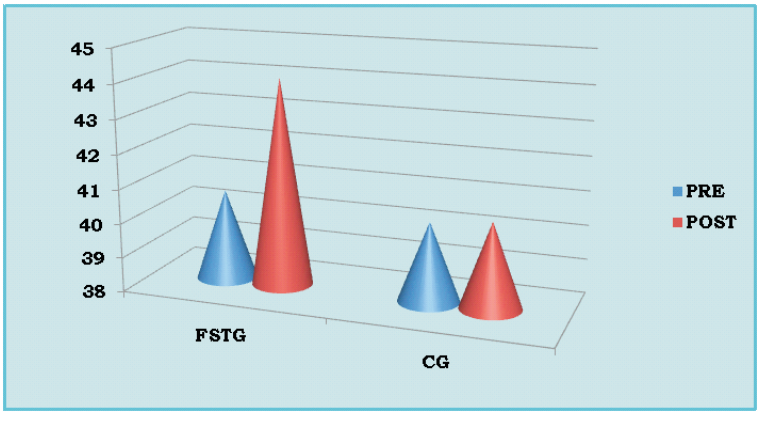


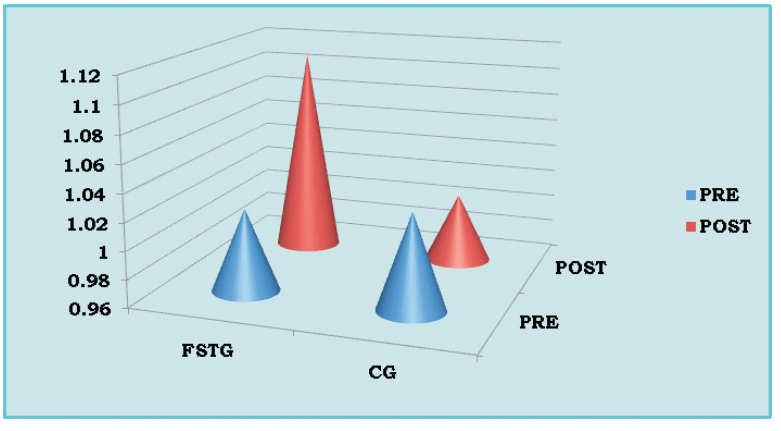
Table – III
Computation of Analysis of Covariance on Bone Mineral Density

Test	Training Group	Control Group	SV	SS	df	MS	F
Pre Test	1.02	1.03	Between	0.00	1	0.000	0.07
			Within	0.07	18	0.00	
Post Test	1.11	1.01	Between	0.05	1	0.05	**16.46***
			Within	0.06	18	0.00	
Adjusted	1.11	1.01	Between	0.06	1	0.06	**29.90***
			Within	0.03	17	0.00	
Mean Gain	0.09	0.02					

Table F- ratio at 0.05 level of confidence for 1 and 18 (df) = 4.41, 2 and 17 (df) = 4.45 *Significant.

Table III shows that the obtained F value on pre test scores on Bone mineral density was 0.07 lesser than the required value of 4.41 to be significant at 0.05 level. This proved there is no significant difference between the groups at initial stage and the randomizations at the initial stage are equal. The obtained post test F value of 16.46 was greater than the required F value of 4.41. Further, the obtained adjusted post test F value of 29.90 was greater than the required F value of 4.45. Hence, it was proved that the functional strength training significantly improved Bone mineral density among men with osteopenia.

Figure-3
Bar Diagram showing the pre and post test mean on Bone Mineral Density



CONCLUSION

The results clearly confirmed that from the current study notorious that the changes over time in the majority of the body composition variables due to the functional strength training. Training treatment altered the distribution of Lean mass, Fat Mass and Bone mineral density among the men with osteopenia.

In summary, Active people who are performing exercise lives longer and healthier (Chakravarthy et al, 2008). In men, Lean Mass is more important than Fat mass. Several mechanisms have been proposed for the associations between Fat Mass and Lean Mass with bone mineral density. Both Lean Mass and Fat Mass may contribute to an increase in bone mineral density by causing increased mechanical loading (Reid, Plank and Evans, 1992).

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