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Effectiveness of nutritional intervention on bone mineral density among women aged 30-50 years in South India.

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KEYWORDS
Bone Mineral Density, Nutritional Intervention, Osteoporosis, Women aged 30-50 years.

ABSTRACT
Low bone mineral density in women will have increased by 40% globally by 2050, considerably increasing the burden of osteoporosis on future generations. The aim of the study was to assess the effectiveness of nutritional intervention on bone mineral density among women aged 30-50 years in South India. A true experimental research design of 20 womens with the age of 30-50 years was assigned in two groups by simple random sampling technique. A standardized tool was used to assess the bone mineral density. In experimental group post-test, 80% had Normal bone density level of bone mineral density, 20% had mildly reduced bone mineral density level of bone mineral density. In control group post-test, 90% had Normal bone density level of bone mineral density, 10% had mildly reduced bone mineral density level of bone mineral density. The nutritional interventional package given to the experimental group's women resulted in a significant improvement in their post-test bone mineral density.

INTRODUCTION

The mineral content of bone tissue is measured by bone mineral density. [1] Low bone mineral density (BMD) is the primary cause of osteoporosis and osteopenia, both of which increase the risk of fragility fracture in elderly women. [2]

Calcium is the predominant component of bone since it makes up the majority of hydroxyapatite crystals or solid particles. In the body, the preservation of blood calcium levels takes precedence over bone tissue. 99% of the calcium reserves in the body are found in bone. Because calcium accounts for 40% of the minerals in bone, dietary calcium consumption and bone mineral density are linked. The calcium supplement was made with ragi flour, soy flour, wheat flour, milk powder, flax seeds, sesame seeds, and oats. Ragi has a calcium concentration of 26%. In reality, 100 g of ragi contains 344 mg of calcium. This implies there's a lesser chance of bone loss, which can lead to osteoporosis and other bone problems. Milk is one of the most complete foods, as it contains all of the elements and vitamins needed for the development of healthy bones, including calcium. Sesame seeds are an alkaline food that promotes bone health due to their high content of organic minerals such as calcium and zinc. Sesame seeds contain around 88 milligrammes of calcium per tablespoon. Wheat bran, like beans, is high in phytates, which prevent the body from absorbing calcium. Flax seeds are considered a nutritious powerhouse, containing calcium, Omega-3 fatty acids, fibre, and protein. Alpha Linolenic Acid (ALA), which has been shown to improve bone metabolism and health. [3]

By 2050, the prevalence of low bone mineral density in women will have increased by 40% globally, considerably increasing the burden of osteoporosis on future generations. [4] The International Osteoporosis

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Foundation discovered that the average calcium consumption ranged between 175 and 1233 mg/day in 74 countries worldwide, with values typically much lower than those recommended for the adult population. Calcium consumption is essential for sustaining skeletal health. [5]

According to estimates of the incidence of very low bone mineral density in Indian women, 20% of the 230 million persons over the age of 50 in 2015 will have osteoporosis. In Indian women, the prevalence of osteoporosis varies by age group, ranging from 8% to 62%. [6]

Over the last 45 years, dietary calcium intake has decreased in both rural and tribal India. In urban (year 2017), rural (year 2012), and tribal (year 2008) people, the average household calcium consumption is 67 percent, 108 percent, and 78.8 percent, respectively. Milk and milk products were consumed by 81.3%, 63.0%, and 14.0% of the assessed urban, rural, and tribal populations, respectively. Cereals and millets were the predominant calcium sources (70, 80, and 91 percent of the urban, rural, and tribal populations, respectively). For calcium, urban households consumed milk and milk products, but rural and tribal groups consumed grains and millets. [7]

Understanding the pattern of bone mineral density in women aged 30 to 50 is critical for osteoporosis prevention, diagnosis, and treatment of its repercussions later in life. It is measured using quantification ultrasound (QUS), which is portable, inexpensive, and emits no ionising radiation. Women must be made aware of the importance of nutritional intervention in both disease prevention and management. Low dietary calcium consumption is a substantial risk factor for osteoporosis and fractures due to long-term secondary hyperparathyroidism and rapid bone turnover. Calcium supplementation inhibits bone remodelling and prevents further bone loss and fractures. It is critical to check dietary calcium consumption since calcium supplementation boosts women's bone mineral density and protects against future degeneration and fractures.

Though many studies are conducted in the area of bone mineral density among women, the researcher could not find any valid study to nutritional intervention on bone mineral density among women. Hence, the researcher felt the need to assess the impact of nutritional intervention on bone mineral density among women aged 30-50 years in South India.

MATERIALS AND METHODS:

The Institutional Review Board / Ethical Committee granted formal permission. A true experimental pre-test and post-test control group research design was done in South India. The samples were assigned using non-probability simple random sampling procedures. 20 womens between the ages of 30 and 50 were divided into two groups: 10 for the experimental group and 10 for the control group. Before beginning data collection, the goal of the study was presented to the participants. The womens provided informed consent and oral consent. Throughout the study, confidentiality was maintained. A pre-test for bone mineral density was performed on womens using a standardized tool. Among the women in the experimental group, a calcium-rich nutritional mixture of ragi, wheat, flax, sesame seeds, and milk powder is administered to women aged 30-50 years. Health information was provided to the control group, and a post-test using a standardized tool was performed on both the interventional and control groups.

RESULTS AND DISCUSSION:

In experimental group, pre-test, all the women 10 (100%) had mildly reduced bone mineral density level of bone mineral density and none of them had normal bone density and Osteoporosis level of bone mineral density. In post-test, Majority of the women 8 (80%) had Normal bone density level of bone mineral density, 2 (20%) had mildly reduced bone mineral density level of bone mineral density and none had Osteoporosis level of bone mineral density. In control group, post-test, all the women 10 (100%) had mildly reduced bone mineral density level of bone mineral density and none of them had normal bone density and Osteoporosis level of bone mineral density. In post-test, Majority of the women 9 (90%) had Normal bone density level of bone mineral density, 1 (10%) had mildly reduced bone mineral density level of bone mineral density and none had Osteoporosis level of bone mineral density. **(Table 1) (Figure1)**

According to Shahnaz Akil et al., (2021), the nulliparous womens group exhibited a considerably greater prevalence of normal BMD than the multiparous group (70.6 percent vs. 47.1 percent). 51.2% of multiparous females had normal BMD, 25.6% had below-average BMD, 18.6% had osteopenia, and 4.7% had osteoporosis. Parity impacts the bone mineral

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density (BMD) of young and middle-aged females as compared to nulliparous females, as measured by a portable ultrasound-based bone densitometer. [8]

In experimental group The calculated paired‘t’ test value of t = -6.365 shows statistically significant difference between effectiveness of the pre-test and post-test of the level of bone mineral density among women aged 30 – 50 years in experimental group. In control group, The calculated paired‘t’ test value of t = -1.882 shows statistically not significant difference between effectiveness of the pre-test and post-test of the level of bone mineral density among women aged 30 – 50 years in control group. **(Table 2)**

Poova Ragavan, S. Ani Grace Kalaimathi, A.F.Annie Raja, and Anitha Babu (2019) found that bone mineral density was 1.92 with a standard deviation of 0.40 before the test and 1.63 with a standard deviation of 0.52 after. The calculated paired' value t3.339 is statistically significant at the 0.05 level. Prior to the test, the mean bone mineral density in the control group was 1.88 with a standard deviation of 0.35, while the mean result after the test was 2.23 with a standard deviation of 0.54. The estimated paired' value t = 2.948 was statistically significant at the p-value is 0.05 level. The experimental group's posttest bone mineral density increased considerably after receiving the nurse interventional package. [9]

In pretest The calculated independent‘t’ test value of t = -1.213 shows statistically not significant difference between Comparison of the level of bone mineral density among women aged 30 – 50 years in pre-test between experimental and control group , in posttest The calculated independent‘t’ test value of t = 4.250 shows statistically highly significant difference between Comparison of the level of bone mineral density among women aged 30 – 50 years in post-test between experimental and control group respectively. (**Table 3)**

Narayanasamy Sangeetha and A. Praveen (2020) reveal that the acquired F value on the Bone Mineral Density pre-test results was 1.04 less than the required value of 2.87 to be significant at the 0.05 level. The actual posttest F value of 7.47 was larger than the required F value of 2.87. Furthermore, the corrected posttest F value of 11.67 obtained was greater than the required F value of 2.87. Dietary supplements resulted with greater changes in bone mineral density. [3]

According to the findings of Hamid Arazi et al. (2018), blood levels of 25OH-D and ALP significantly rose in the concurrent training-milk, concurrent training and milk groups, with a greater increase in the concurrent training-milk group (p –value is 0.05). Furthermore, the right and left hip BMD rose significantly in the concurrent training-milk and concurrent training groups, with the concurrent training-milk group increasing significantly more (p –value is 0.05). Contemporaneous training-milk and contemporaneous training also enhanced lumbar spine BMD substantially (p –value is 0.05). [10]

CONCLUSION:

Nutritionally enriched supplements may be the best options for improving bone health since they reduce osteoclast activity while promoting osteoblast activity during bone formation. Ragi, wheat, flax, sesame seeds, and milk powder are all high in nutrients that have been demonstrated to increase bone mass density and reduce the risk of osteoporosis in adult women. Low calcium consumption has been associated to negative effects on bone mineral balance. Womens in the experimental group got a nutritional intervention package that significantly increased their posttest bone mineral density levels.

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The authors report no conflicts of interest in this work.

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TABLES:

Table 1: Frequency and percentage wise distribution of Pre-test and post- test of the level of bone mineral density assessment among women aged 30 – 50 years in experimental and control group.

(N = 10+10)

LEVEL OF BONE MINERAL DENSITY	**EXPERIMENTAL GROUP**			
	PRETEST		**POSTTEST**	
	n	**%**	**n**	**%**
Normal bone density	0	0	8	80
Mildly reduced bone mineral density	10	100	2	20
Osteoporosis	0	0	0	0
	CONTROL GROUP			
LEVEL OF BONE MINERAL DENSITY	**PRETEST**		**POSTTEST**	
Normal bone density	0	0	1	10
Mildly reduced bone mineral density	10	100	9	90
Osteoporosis	0	0	0	0

Table 2: Effectiveness of the Pre-test and post- test of the level of bone mineral density assessment among women aged 30 – 50 years in experimental and control group.

(N = 10+10)

BONE MINERAL DENSITY - EXPERIMENTAL GROUP					
TEST	**MEAN**	**STANDARD DEVIATON**	**MEAN DIFFERENCE**	**Paired 't' VALUE**	**'p' VALUE**

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Pre-test	-1.32	0.257	-2.21	-6.365	**0.001** **S***
Post-test	0.890	0.998			
BONE MINERAL DENSITY -CONTROL GROUP					
Pre-test	-1.22	0.042	-0.450	-1.882	0.092 NS
Post-test	-0.770	0.727			

S- significant, NS- Non significant

Table 3: Comparison of the Pre-test and post- test of the level of bone mineral density assessment among women aged 30 – 50 years between experimental and control group.

(N = 10+10)

Test	**GROUP**	**MEAN**	**STANDARD DEVIATON**	**MEAN DIFFERENCE**	**Independent 't' VALUE**	**'p' VALUE**
Pretest	**Experimental**	-1.32	0.257	-0.10	-1.213	0.241 NS
	Control	-1.22	0.421			
Posttest	**Experimental**	0.890	0.998	1.66	4.250	**0.001** **S***
	Control	-0.770	0.727			

S- significant, NS- Non significant

Figure-1

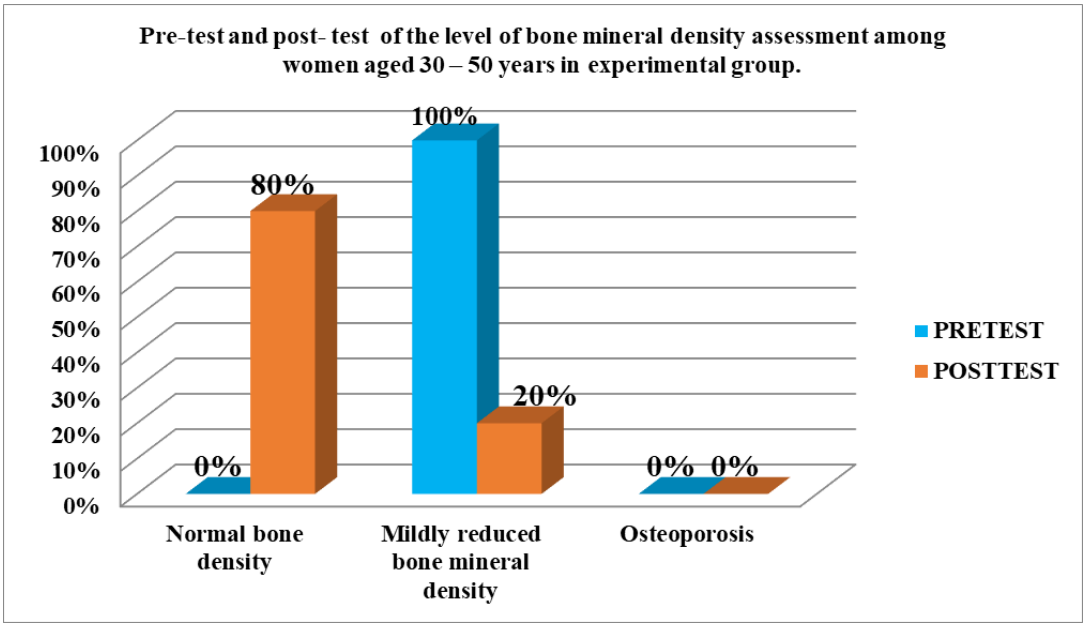

Figure 1: Percentage wise distribution of Pre-test and post- test of the level of bone mineral density assessment among women aged 30 – 50 years in experimental group.