THE IMPACT OF NUTRITIONAL INTERVENTION ON BONE MINERAL DENSITY AMONG WOMEN IN ARAGONDA,CHITTOOR – A PILOT STUDY

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ABSTRACT

The prevalence of poor bone mineral density in women will have risen by 40% globally by 2050, which will significantly raise the burden of osteoporosis on future generations. The aim of the study was to assess the impact of nutritional intervention on bone mineral density among women in selected urban areas. A pilot study of true experimental research design of 20 women 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 2, 60% had normal, 40% had mildly reduced bone mineral density. In control group post-test 2, 30%) had normal, 70% had mildly reduced bone mineral density level. The nutritional interventional package to the women in the experimental group had significant improvement in their posttest level of bone mineral density.

Keywords: Nutritional Intervention, Bone Mineral Density, Osteoporosis, Women, Urban areas.

INTRODUCTION

Bone mineral density is the measurement of the mineral content of bone tissue. [1] Osteopenia and osteoporosis, both of which raise the risk of fragility fracture in elderly women, are primarily caused by low bone mineral density (BMD). [2]

As calcium makes up the majority of the hydroxyapatite crystals or solid particles, it is the main component of bone. The preservation of blood calcium levels takes precedence over bone tissue in the body. Bone contains 99% of the body's calcium reserves. Calcium makes up 40% of the minerals in bone, hence dietary calcium consumption and bone mineral density are closely related. Ragi flour, soy flour, wheat flour, milk powder, flax seeds, sesame seeds, and oats were used to create the calcium supplement. The calcium content of ragi is 26%. Actually, 100 grammes of ragi contain 344 milligrammes of calcium. This means a lower risk of bone loss, which can result in osteoporosis and other bone diseases. One of the most complete foods is milk, which is rich in the minerals and vitamins required for the development of strong bones, including calcium. Sesame seeds are an alkaline food that supports bone health because they are rich in organic minerals, including calcium and zinc. Sesame seeds include about 88 milligrammes of calcium per tablespoon. Like beans, wheat bran contains a lot of phytates, which stop the body from absorbing calcium. Flax seeds are regarded as a powerhouse of nutrients, including calcium, Omega-3 fatty acids, fibre, and protein. Alpha Linolenic Acid (ALA), which is known to boost bone metabolism and enhance bone health. [3]

The prevalence of poor bone mineral density in women will have risen by 40% globally by 2050, which will significantly raise the burden of osteoporosis on future generations. [4]The International Osteoporosis Foundation found that, in 74 countries worldwide, the average calcium consumption varied between 175 and 1233 mg/day, with values frequently significantly lower than those advised for the adult population. Dietary calcium intake is crucial for maintaining skeletal health. [5]

Estimates of the prevalence of very low bone mineral density in Indian women indicate that 20% of the 230 million people anticipated to be over 50 in 2015 will have osteoporosis. The prevalence of osteoporosis in Indian women varies by age group, ranging from 8% to 62%. [6]

Both rural and tribal groups in India have shown a decline in dietary calcium intake over the past 45 years. The average household calcium consumption is 67 percent, 108 percent, and

78.8 percent, respectively, in urban (year 2017), rural (year 2012), and tribal (year 2008) subjects. Household consumption of milk and milk products was 81.3%, 63.0%, and 14.0% for the urban, rural, and tribal populations surveyed, respectively. The primary sources of calcium were cereals and millets (70, 80, and 91 percent of urban, rural, and tribal population, respectively). Urban households relied on milk and milk products whereas rural and tribal communities relied on cereals and millets for calcium. [7]

Understanding the pattern of bone mineral density in women between the ages of 30 and 50 is essential for osteoporosis prevention, diagnosis, and therapy of its consequences in later life. Quantification ultrasound (QUS), which is portable, affordable, and emits no ionising radiation, is used to measure it. Women need to be made aware of the need for nutritional intervention to both prevent and manage the disease. Due to long-term secondary hyperparathyroidism and resulting accelerated bone turnover, low dietary calcium intake is a significant risk factor for osteoporosis and fractures. Supplemental calcium slows down bone remodelling and stops additional bone loss and fractures. As calcium supplementation increases women's bone mineral density and guards against future degeneration and fractures, it is crucial to track dietary calcium intake.

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 in selected urban areas.

MATERIALS AND METHODS:

A formal permission was obtained from Institutional Review Board / Ethical Committee. The pilot study of true experimental pre-test – post-test control group research design was conducted in urban areas for a period of 10 days. Through non-probability simple random sampling techniques, the samples was assigned. 20 women with the age of 30-50 years was assigned in two groups, 10 women for experimental group – and 10 women for control group. The purpose of the study was explained to the participants before starting the data collection. Informed consent and oral consent were obtained from the women. Confidentiality was maintained throughout the study. Pretest was conducted among women by bone mineral density with standardized tool. Intervention are calcium rich nutritive mixture is prepared of ragi, wheat, flax, sesame seeds, milk powder among women in experimental group. Health talk given to control group and post test was conducted for both interventional and control group by the bone mineral density with standardized tool.

RESULTS AND DISCUSSION:

In experimental group pre-test, Majority of the women 9 (90%) had mildly reduced bone mineral density level of bone mineral density, 1 (10%) had Normal bone density level of bone mineral density and none had Osteoporosis level of bone mineral density. **In post-test 1**, Majority of the women 3 (30%) had Normal bone density level of bone mineral density, 7 (70%) had mildly reduced bone mineral density level of bone mineral density and none had Osteoporosis level of bone mineral density. **In post-test 2**, Majority of the women 6 (60%) had Normal bone density level of bone mineral density, 4 (40%) had mildly reduced bone mineral density level of bone mineral density and none had Osteoporosis level of bone mineral density. **In control group pre-test**, Majority of the women 8 (80%) had mildly reduced bone mineral density level of bone mineral density, 2 (20%) had Normal bone density level of bone mineral density and none had Osteoporosis level of bone mineral density. **In post-test 1**, Majority of the women 2 (20%) had Normal bone density level of bone mineral density, 8 (80%) had mildly reduced bone mineral density level of bone mineral density and none had Osteoporosis level of bone mineral density. **In post-test 2**, Majority of the women 3 (30%) had Normal bone density level of bone mineral density, 7 (70%) had mildly reduced bone mineral density level of bone mineral density and none had Osteoporosis level of bone mineral density. **(Table 1)**

The study findings were supported with ShahnazAkil et al., (2021) revealed that the nulliparous group had a significantly higher prevalence of normal BMD than the multiparous group (70.6 percent vs. 47.1 percent). Among the multiparous females, 51.2% had normal BMD, 25.6% had BMD that was below average, 18.6% had osteopenia, and 4.7% had osteoporosis. In comparison to nulliparous females, the parity affects the bone mineral density (BMD) of young and middle-aged females as evaluated by a portable ultrasound-based bone densitometer.[8]

In experimental group The calculated **paired't' test value of t = -2.55** shows statistically significant difference between Comparison of the Pre-test and post-test1 of the level of bone mineral density among women in selected urban areas in experimental group and The calculated **paired't' test value of t = -2.98** shows statistically significant difference between Comparison of the Pre-test and post-test2 of the level of bone mineral density among women in selected urban areas in experimental group respectively. **In control group,** The calculated **paired'ť' test value of t = 1.00** shows statistically not significant difference between Comparison of the Pre-test and post-test1 of the level of bone mineral density among women in selected urban areas in control group and The calculated **paired'ť' test value of t = -0.954**shows statistically not significant difference between Comparison of the Pre-test and post-test2 of the level of bone mineral density among women in selected urban areas in control group respectively. **(Table 2)**

The study findings were supported to PoovaRagavan, S. Ani Grace Kalaimathi, A.F.Annie Raja, AnithaBabu (2019) showed 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. At the 0.05 level, the estimated paired' value t3.339 is statistically significant. In the control group, the mean bone mineral density prior to the test was 1.88 with S.D. 0.35 while the mean value following the test was 2.23 with S.D. 0.54. At the p 0.05 level, the estimated paired' value t 2.948 was statistically significant. The experimental group's posttest level of bone mineral density significantly increased after receiving the nursing interventional package.[9]

The calculated **independent'ť' test value of t = -0.845** shows statistically not significant difference between Comparison of thelevel of bone mineral density among women in pre-test between experimental and control group, The calculated **independent'ť' test value of t = 1.333** shows statistically not significant difference between Comparison of thelevel of bone mineral density among women in post-test 1 between experimental and control group and The calculated **independent'ť' test value of t = 2.251** shows statistically significant difference between Comparison of thelevel of bone mineral density among women in post-test 2 between experimental and control grouprespectively. (**Table 3)**

The study findings were supported with NarayanasamySangeetha and A. Praveen (2020)shows the obtained F value on the Bone Mineral Density pre-test results was 1.04 less than the necessary value of 2.87 to be significant at the 0.05 level. The posttest F value that was actually attained, 7.47, was higher than the necessary F value, 2.87. Moreover, the corrected posttest F value of 11.67 that was achieved was higher than the needed F value of 2.87. Dietary supplements led to more significant changes in bone mineral density.[3]

CONCLUSION:

By reducing osteoclast activity and increasing osteoblast activity during bone growth, nutritionally enhanced supplements may be the greatest alternatives for enhancing bone health. Ragi, wheat, flax, sesame seeds, and milk powder are all rich in nutrients that have been shown to improve bone mass density and lower the incidence of osteoporosis in adult women. Low dietary calcium intake was linked to detrimental effects on the equilibrium of bone minerals. The experimental group of women received a nutritional intervention package that significantly improved their posttest levels of bone mineral density.

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TABLES:

Table 1: Frequency and percentage wise distribution of Pre-test, post-test1 and post-test 2 of the level of bone mineral density assessment among women in selected urban areas in experimental and control group.

LEVEL OF BONE MINERAL DENSITY	EXPERIMENTAL GROUP					
	PRETEST		POSTTEST 1		POSTTEST 2	
	n	%	n	%	n	%
Normal bone density	1	10	3	30	6	60
Mildly reduced bone mineral density	9	90	7	70	4	40
Osteoporosis	0	0	0	0	0	0
	CONTROL GROUP					
LEVEL OF BONE MINERAL DENSITY	PRETEST		POSTTEST 1		POSTTEST 2	
Normal bone density	2	20	2	20	3	30
Mildly reduced bone mineral density	8	80	8	80	7	70
Osteoporosis	0	0	0	0	0	0

Table 2: Effectiveness of the Pre-test, post-test1 and post- test 2 of bone mineral density among women in selected urban areas in experimental and control group.

BONE MINERAL DENSITY - EXPERIMENTAL GROUP					
TEST	**MEAN**	**STANDARD DEVIATON**	**MEAN DIFFERENCE**	**Paired 't' VALUE**	**'p' VALUE**
Pre-test	-1.090	0.810	-1.030	-2.55	**0.031***

Post-test 1	-0.060	1.42			**S**
Pre-test	-1.090	0.810	-2.050	-2.98	**0.015*** **S**
Post-test 2	0.960	1.707			
BONE MINERAL DENSITY -CONTROL GROUP					
Pre-test	-0.760	0.931	0.02	1.00	0.343 NS
Post-test 1	-0.780	0.939			
Pre-test	-0.760	0.931	-0.25	-0.954	0.365 NS
Post-test 2	-0.510	1.16			

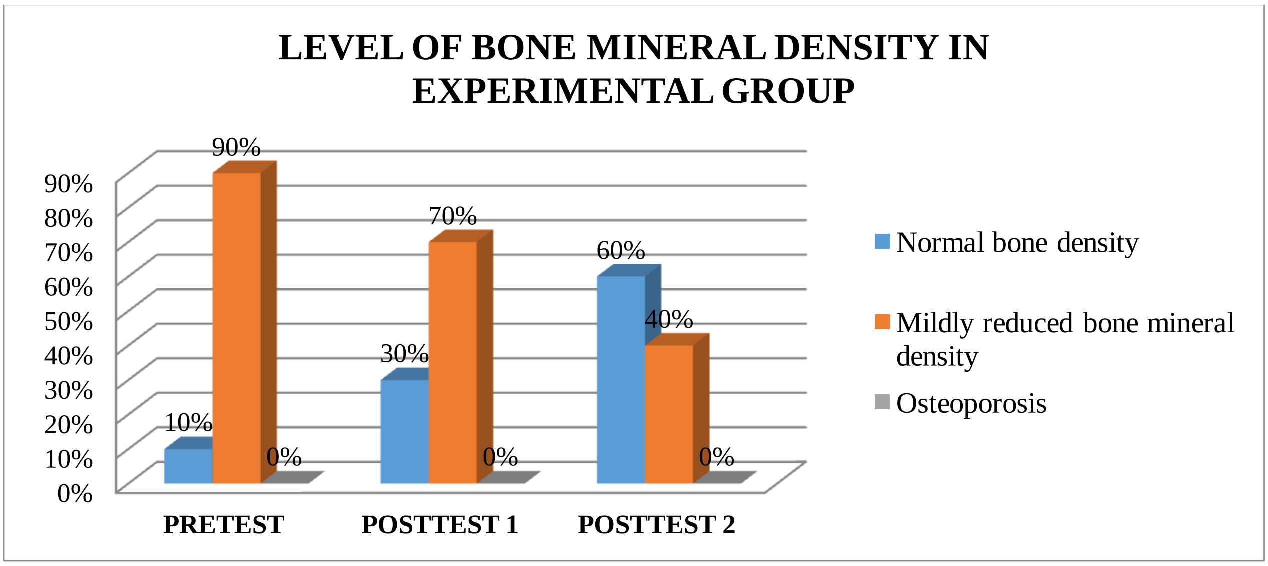
S- significant, NS- Non significant

Table 3: Comparison of the Pre-test, post-test1 and post- test 2 of bone mineral density among women in selected urban areas between experimental and control group.

BONE MINERAL DENSITY						
Test	**GROUP**	**MEAN**	**STANDARD DEVIATON**	**MEAN DIFFERENCE**	**Independent 't' VALUE**	**'p' VALUE**
Pretest	**Experimental**	-1.09	0.810	-0.330	-0.845	0.409
	Control	-0.760	0.931			
Posttest-1	**Experimental**	-0.060	1.42	0.720	1.333	0.199
	Control	-0.780	0.939			
Posttest-2	**Experimental**	0.960	1.70	1.470	2.251	**0.037*** **S**
	Control	-0.510	1.16			

S- significant, NS- Non significant

FIGURE:



Percentage wise Distribution of Pre-test, post-test1 and post- test 2 of the level of bone mineral densityassessment among women in selected urban areas in experimental group

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