ABSTRACT

Bone tissues contain more than 99 per cent of total body calcium. Dietary calcium is the most important nutrient required for the attainment and maintenance of bone mass throughout life. Calcium is considered a major risk factor for osteopenia/osteoporosis. The present study assessed the impact of nutritional calcium supplements on calcium deficient women of different physiological states. Nutrition education was also imparted to the selected subjects. The impact of nutritional calcium supplement and nutrition education on women of different physiological states was assessed by conducting Bone Mineral Density test. Serum calcium and serum alkaline phosphatase levels of the subjects were also studied.

A total of 360 subjects who were declared calcium deficient by the Doctor on the basis of Bone Mineral Density test were studied. The study was conducted in three phases:

In Phase I (Pre - intervention) data was collected on socio-economic status, menstrual history, reproductive history, lactational history, physical activity pattern as well as dietary habits with the help of self structured and pre tested questionnaire. An anthropometric measurement (height and weight) of each subject was recorded using standardized procedures. Blood samples were analyzed for serum calcium and alkaline phosphatase level. The calcium content of commonly edible food stuffs of District Kurukshetra was determined by standard method. Recipes were developed from locally available calcium rich sources and sensory evaluation was done using 9 point Hedonic scale. The developed recipes were: khus-khus coconut ladoo, coconut burfi, til ladoo, paushtik ladoo, gujia, dhandai, namkeen, rings, idli and chilla. These recipes were demonstrated and included in nutrition education booklet distributed to each subject undergoing trial.

Phase II was the Intervention Phase. For the purpose of the study, 360 calcium deficient women who agreed to take part in interventional trial were divided into two groups namely osteopenia (180) and osteoporosis (180). Each group was further categorized into three categories according to different
physiological state specifically normal (npnl) (60), premenopausal (60) and postmenopausal (60). Different interventions i.e. nutritional calcium supplement (15), nutrition education (15) and nutritional calcium supplement plus nutrition education (15) were given to both the groups for a period of 3 months (90 days). The CONTROL (15) group was not given any type of intervention. Dietary intake of the interventional trial subjects was studied at 0th days of intervention.

Bone Mineral Density test was again conducted on 45th day of intervention trials.

Phase III was the Post Intervention Phase. After 90 days of intervention with nutrition education, nutrition calcium supplement and nutritional calcium supplement plus nutrition education, data regarding dietary intake was collected from the selected group of subjects. Bone Mineral Density test was again conducted for calculation of the BMD- T scores. Blood samples were again taken by the lab technician to study the serum calcium as well as alkaline phosphatase levels.

The data obtained were statistically analyzed using SPSS (version-11.5) computer programme for mean, standard deviation, T-test, ANOVA to draw conclusions.

Socio-demographic data showed that majority of the subjects were married belonging to joint family system. A fairly large number were educated. Calcium deficient symptoms among subjects were joint pain (56.11%), irregular heart beat (12.78 %), muscle cramps (4.44%), yellowish teeth (5.28 %), poor sleep disorder (15.56%), nerve irritability (2.5%) and brittle bone (5%). Regular menstrual cycle with normal blood flow was reported by 42.77 and 58.33 per cent of the subjects. Most (95.28%) of the subjects were vegetarian (86.67%) and were consuming three meals per day.

After giving different interventions namely nutritional calcium supplement (NCS), nutrition education (NE) and nutritional calcium supplement + nutrition education (NCS+NE), a positive response was observed in Bone Mineral Density of the subjects, indicating best response in nutritional calcium supplement + nutrition education (NCS+NE) subgroup followed by nutritional calcium supplement (NCS) and nutrition education (NE) respectively.
In osteopenic group, maximum per cent increase in BMD-T scores was found in those who were on NCS+ NE intervention in each category of normal (43.43%), premenopausal (43.9%) and postmenopausal (30.52%) subjects. Minimum per cent increase in BMD-T scores was found in normal (20.88%), pre (23.74%) and postmenopausal (2.04%) category subjects who were on NE intervention. Whereas, a moderate per cent increase in normal (37.43%), premenopausal (35.11%) and postmenopausal (28.43%) category subjects was found who were on NCS intervention respectively.

The intervention trial based on NCS+NE was most effective in increasing serum calcium levels i.e. 0.80, 1.60 and 1.70 per cent in normal (nppnl), premenopausal and postmenopausal conditions respectively. Serum calcium level increased marginally in normal (0.34%), pre (-0.22%) and postmenopausal (0.57%) subjects after intervention with NE. However, moderate per cent increase in serum calcium level was seen after the intervention trial with NCS in all three states i.e. normal (0.815), pre (0.11%) and postmenopause (0.92%) respectively.

Maximum decrease in serum alkaline phosphatase was observed in the subjects who were on NCS intervention in normal (-4.18%), pre (-1.73%) and postmenopause (-3.62%) categories respectively. Minimum per cent decrease in serum alkaline phosphatase level was noticed when intervention with NE was given in all three categories of normal (0.69%), pre (-0.53%) and postmenopause (-3.08%) respectively. Whereas, a moderate decrease in serum alkaline phosphatase level was seen after the intervention trial with NCS+NE i.e. -1.29, -2.02 and -3.59 per cent in corresponding categories of normal (nppnl), pre and post menopausal osteopenic subjects.

In osteoporotic group, maximum per cent increase in BMD-T scores was found in those who were on NCS+ NE in each category of normal (48.61%), pre (47.6%) and postmenopausal (42.35%) subjects. Minimum per cent increase in BMD-T scores was found in normal (30.51%), pre (26.83%) and postmenopausal (22.98%) category subjects who were on NE intervention. Whereas, a moderate per cent increase in normal (45.79%), premenopausal (39.86%) and postmenopausal (37.42%) category subjects was found who were on NCS intervention respectively.
The intervention trial based on NCS+NE was most effective in increasing serum calcium levels in normal (npnl) osteoporotic subjects (1.74%) followed by postmenopausal (0.60%) and premenopausal (0.24%) respectively. Minimum per cent increase in serum calcium level was noticed when intervention with NE was given in normal (0%), premenopausal (0.01%) and postmenopausal (-0.02%) osteoporotic subjects respectively. However, efficiency of NCS in increasing respective serum calcium level was seen maximum in premenopausal (0.85%) osteoporotic subjects followed by postmenopausal (0.72%) and normal (npnl) (0%) subjects. Maximum decrease in serum alkaline phosphatase was noticed in NCS+NE sub group and the figures were -3.44, -5.27 and -4.07 per cent respectively in corresponding categories of normal (npnl), pre and postmenopausal subjects. Minimum per cent decrease in serum alkaline phosphatase level was observed when intervention with NCS was given to normal (-0.57%), pre (-2.34%) and postmenopausal subjects (-0.98%) respectively. Whereas, a moderate decrease in serum alkaline phosphatase level was seen after the intervention trial with NE i.e. -2.99, -2.88 and -3.33 per cent in corresponding categories of normal (npnl), pre and postmenopausal osteoporotic subjects.

The study thus revealed that nutritional calcium supplement along with nutrition education decreased the intensity of osteopenia or osteoporosis by increasing the Bone Mineral Density. The interventions have a marginal influence on serum calcium and serum alkaline phosphatase levels thus improving the quality of life.