CHAPTER V

DISCUSSION

The study results were analyzed and discussed in detail in relation to the objectives, need for the study, related similar studies and conceptual framework. It is presented in the light of objectives.

Characteristics of the study participants

The description of the background variables of the study participants are as follows: the percentage distribution of the demographic variables of the subjects in both the groups (table 4) revealed that majority of the female school teachers were in the age group of 41-45 years and married 49 (57.6%) & 81 (95.3%) in the study group and 46 (54.1%) & 83 (97.6%) in the control group respectively. The data regarding educational status showed that the majority of the subjects in the study group 52 (61.2%) were postgraduates and in the control group 46 (54.1%) were undergraduates. Most of them hailed from the semi-urban area 48 (56.5%) in the study group and 49 (57.6%) in the control group.

With relation to personal variables (table 5), the type of diet revealed that 45 (52.9%) subjects in the study group and 51 (60%) subjects in the control group were vegetarians and the remaining 40 (47.1%) in the study group and 34 (40%) in the control group were mixed vegetarians. Only four (4.7%) subjects in the study group and three (3.5%) in the control group had family history of osteoporosis, whereas 81 (95.3%) and 82 (96.5%) subjects
in the study and control groups respectively, had no family history of osteoporosis. The sedentary lifestyle was noted among 23 (27.1%) subjects in the study group and 14 (16.5%) subjects in the control group. Six (7.1%) subjects in the study group and five (5.9%) in the control group said ‘yes’ to the practice of exercises which included yoga and walking. The data on body mass index revealed that 42 (49.4%) and 35 (41.2%) subjects in the study and control groups belonged to overweight category and eight (9.4%) and nine (10.6%) subjects in the study and control groups belonged to underweight category. The chi-square test showed that there were no statistically significant differences between the groups for all background variables. These results ensured the homogeneity of the two groups, which allowed the data to be pooled for further data analysis.

The first objective was to determine the effectiveness of Osteoporosis Prevention Programme on knowledge in the following aspects: osteoporosis risk factors, exercises and calcium intake of female school teachers.

The comparison of mean scores of knowledge on osteoporosis risk factors between the study (SG) (7.73, 7.94, 7.96) and control group (CG) (2.28, 2.11, 2.90) (table 6) during posttests-I, II & III showed statistically significant differences at p<0.001. Also, there was an improvement in the knowledge on exercises (SG: 13.88, 13.77, 13.67; CG: 3.88, 4.13, 5.49) (table 7) and knowledge on calcium intake mean scores (SG: 14.06, 13.99, 14.15; CG: 3.76, 3.76, and 4.59) (table 8) during posttest-I, II and III, which was statistically significant at p<0.001.
These findings are consistent with the results of another study conducted by Blalock, Currey, DeVellis, DeVellis, Giorgino, Anderson, et al. (2000) who examined the effects of brief written educational materials on osteoporosis related knowledge, beliefs and behaviours among women. The receipt of information packet was associated with changes in knowledge and beliefs (p < 0.01).

A similar study executed by Brecher, Pomerantz, Snyder, Janora, Klotzbach-Shimomura and Cavalieri (2002) supports the finding of the current study. The researchers evaluated the effectiveness of a multidisciplinary primary osteoporosis prevention program among community dwelling women aged 25 to 75 years and found out that the participants in the intervention group had an increase in their knowledge on osteoporosis, calcium intake and exercise compared with the control group and also, subjects in the intervention group were more likely to be changing their calcium intake and practice exercise.

The comparison of the three aspects of knowledge within the study group (table 9) using paired t test also showed marked improvement in the knowledge which was statistically significant at p < 0.001. The mean scores of knowledge on osteoporosis risk factor, knowledge on exercise and knowledge on calcium intake in the study group were as follows, pretest: 1.68, 3.02 & 3.17 posttest-III: 7.96, 13.67 & 14.15.

Results of the comparable descriptive study by Elizabeth Byrne Rodzik (2008) provided evidence that women participants in an osteoporosis health
education program demonstrated significantly higher levels of knowledge after completing the program. The study was carried out to test the hypothesis whether college-age women who participated in an osteoporosis education program had greater knowledge about osteoporosis prevention and a higher level of confidence (self-efficacy) for activities related to osteoporosis prevention. The educational intervention implemented for 149 college-age women at a Midwestern community college reflected a significant increase in both general and specific knowledge of osteoporosis and the associated risk factors (pretest mean = 15.20, SD = 3.70, posttest mean = 19.43, SD = 2.82, t = 15.12, p < 0.05).

In the current study, there were statistically significant differences found over a period of the study (pretest, posttests-I, II, III,) with related to knowledge on osteoporosis risk factor p < 0.001 (F=404.416), knowledge on exercises at p < 0.001 (F=1127.872) and knowledge on calcium intake at p < 0.001 (F = 1114.664) between the study and control groups (table 11).

A study conducted by Abrahamson and Khan (2006) to assess the effect of education program on knowledge of osteoporosis among in-patients in a rehabilitation centre resulted in the improvement of knowledge on osteoporosis. The baseline osteoporosis knowledge test score was 7.26 (out of 20) for the intervention group. The mean difference of knowledge was increased at six months, with a significant mean increase of 2.67. The results showed statistically significant increase in the reported follow-up.
The improvement in the three aspects of knowledge and the existence of statistically significant differences between the groups and within the study group following the OPP, have directed the investigator to accept the following hypotheses (H1, H2 & H3):

- There is a significant difference in knowledge on osteoporosis risk factors among female school teachers who participate in the OPP than those who do not

- There is a significant difference in knowledge on exercises among female school teachers who participate in the OPP than those who do not

- There is a significant difference in knowledge on calcium intake among female school teachers who participate in the OPP than those who do not

The second objective was to find out the effectiveness of Osteoporosis Prevention Programme on self-efficacy in the following aspects: perception and practice of exercises & intake of dietary calcium of female school teachers.

The independent t test results revealed the mean scores of perception on exercises in the study group (79.85, 88.98 & 96.21) to be higher than that in the control group (38.73, 46.13 & 50.28) during the posttest-I, II & III (table 12) and was statistically significant at p<0.001. Similarly, there was an improvement in the mean scores of perception on intake of dietary calcium in
the study group (81.52, 90.63 & 95.94) than in the control group (46.93, 48.49 & 52.16) and was statistically significant at p<0.001 in all the posttests (table 13).

The comparison of pretest and posttest data within the study group (table 25) showed a significant increase in the perception on exercises (pretest mean = 39.23; posttest mean = 96.21; t = 47.061, p<0.001) and perception on intake of dietary calcium (pretest mean = 46.94, posttest mean = 95.94; t = 58.157, p<0.001) during posttest-III.

The findings of the current study are consistent with the results of another study conducted by Elizabeth Byrne Rodzik (2008) among 149 college-aged women as they reported a higher self-efficacy intent towards life activities to prevent osteoporosis such as calcium intake and exercise after the educational program. The results of the study showed a significant increase in the influence of the educational program on college-aged women to adopt lifestyle behavioral changes to both exercise (pretest mean = 66.21, SD = 23.15; posttest mean = 78.26, SD = 20.02; t = 8.53, p< 0.05); and calcium intake (pretest mean = 76.34, SD = 19.94; posttest mean = 84.40, SD = 16.28); (t = 7.00, p < 0.05).

The results of the present study indicated that the osteoporosis prevention program positively influenced the participants’ belief that they could adopt the osteoporosis prevention behaviors which include exercise and intake of dietary calcium.
A study by Horan, Kim, Gendler, Froman and Patel (1998) included 201 women in the age group of 35-95 years who were not diagnosed with osteoporosis. The purpose of the study was to develop and evaluate the osteoporosis self-efficacy scale to measure self-efficacy related to the osteoporosis prevention behaviors of calcium intake and exercise. In addition, the study evaluated the role of self-efficacy in modifying dietary and physical exercise activities. Their findings showed Cronbach’s alpha coefficient for exercise at 0.94 and calcium at 0.93.

The current study also assessed the modification in behavior of the study participants which included practice of exercises in the study group and intake of dietary calcium in both the groups. The analysed data revealed that the practice of exercises (table 14) improved steadily from posttest-I [good practice by 49 (57.6%) subjects] to posttest-II [good practice by 68 (81.9%) subjects] and then to posttest-III [good practice by 77 (95.1%) subjects]. The number of subjects who practiced exercises regularly (table 20) also increased in each posttests [I- 54 (63.5%), II- 68 (81.9%) & III- 71 (87.7%)]. The comparison of mean exercise practice scores (table 18 &19) also confirmed that there was an improvement in the overall practice of exercise among the subjects in the study group during posttest-II (41.12) & III (41.96) than posttest-I (38.0), at p<0.001.

Such similar results were noticed in a study executed by Schulman, Williams, Khera, Sahba, Michelson and Fine (2007) with a purpose to investigate the effectiveness of education on osteoporosis and lifestyle modification among patients during their outpatient visits to an orthopaedic
surgeon’s office. The data were collected from 80 female patients (premenopausal- 54 & postmenopausal- 26) regarding their knowledge on osteoporosis, calcium intake and exercise. Reassessment was carried out after six months. In response to the educational intervention, significant improvements were seen in terms of the patient’s ability to identify being female as a major risk factor (p < 0.001), and the understanding that females should begin adequate calcium intake at a young age (p < 0.001). Significant increase occurred in daily calcium intake (p<0.001) and in the level of exercises at p < 0.003.

In the study group the mean scores of the balancing, hip and spine exercises showed an improved scores in the posttest-III (11.95, 10.19 & 3.10) than in the posttest-I (10.98, 8.71 & 2.22) and these differences were statistically significant at p<0.001. Improvement in the practice of toe and heel walking at p<0.01 and squat at p<0.05 was also noted (table 16). These results indicated that the regular practice of exercises had improved their skills in doing the exercises.

With related to the practice of intake of dietary calcium estimated by FFQ method (table 23) statistically significant improvements at p<0.001 was noted during the posttest-I, II & III in the study group (273.55, 594.38, 691.61) than in the control group (222.535, 225.318, 239.246). Similar improvements were noticed in the estimation of intake of dietary calcium by the subjects in the study group using the 24 hour dietary recall method (table 24), which was also statistically significant at p < 0.001 in all the posttests.
In the study group, the comparison between the pretest and posttest also pointed out a marked increase in the intake of dietary calcium by both the methods (table 25) FFQ (pretest mean=227.80; posttest mean= 691.610; t=42.533, p<0.001) and 24 hour dietary recall (pretest mean = 218.252; posttest mean = 665.19; t =38.939, p<0.001). Also the percentage distribution of intake of dietary calcium by FFQ (table 21) showed that during posttest-II 43 (51.8%) and posttest-III 72 (88.9%) subjects had ≥ 600 mg of dietary calcium per day in the study group.

The above findings were supported by a study conducted by Blalock, DeVellis, Patterson, Campbell and Orenstein (2002). The researchers evaluated the effects of two interventions (tailored vs nontailored educational materials at the individual level and community based intervention which included establishment of osteoporosis resource center, workshop on osteoporosis prevention & free BMD screening) on calcium intake and exercise among 547 women in 12 countries in western North Carolina. Irrespective of the intervention group, the calcium intake increased by an average of about 500mg/day over the course of the study. Changes involving exercises were modest.

The ICMR expert group (2009) recommends 600 mg of dietary calcium intake per day for an adult Indian woman, whereas the recommendation by WHO is 1000mg/day for an adult woman. Such a paradoxical situation mandates calcium balance studies of different physiological states residing in different geographical regions of the world. Pending such results, become available, calcium recommendation for India,
particularly for adolescents, pre and postmenopausal women may perhaps be revised upwards to bring them in the range of WHO recommendation.

The results of comparison of perception of exercises (F = 802.204) & intake of dietary calcium (F = 641.794) and practice of intake of dietary calcium (FFQ; F = 861.817, 24 hrs dietary recall; F = 657.883) over a period of time between the groups depicted a statistical significant difference at p<0.001 (table 27).

Piaseu, Schepp and Belza (2002) stated that knowledge of adequate calcium intake and exercise to prevent osteoporosis is a strong determinant of a woman’s self-efficacy to perform healthy lifestyle behaviors and enhancement of self-efficacy facilitates the link between knowledge and behaviors by persuading the individuals to accomplish the requisite behaviors within their control.

The influence of cognitive-perceptual factors as stated in the conceptual framework of the present study are very clear as both the knowledge on osteoporosis and perception on the self- capabilities showed consistent improvement after the OPP that resulted in the engagement of osteoporosis preventive behaviours. This finding is consistent with Bandura’s (1986) prediction in his social cognitive theory that people with higher perceived self-efficacy are more likely to engage in physical activity than are those with lower self-efficacy.

The current study findings related to the aspects of self-efficacy clearly indicated the desirable influence of OPP on perception on exercises and
intake of dietary calcium as well as on practice of exercises and intake of dietary calcium. Hence, the postulated hypotheses (H4, H5 & H6) were accepted. The hypotheses were

- There is a significant difference in perception on exercises among female school teachers who participate in the OPP than those who do not

- There is a significant difference in perception on intake of dietary calcium among female school teachers who participate in the OPP than those who do not

- There is a significant difference in practice of intake of dietary calcium among female school teachers who participate in the OPP than those who do not

In the present study a mild increase in the aspects of knowledge (osteoporosis risk factor pretest mean = 2.07; posttest mean = 2.90, exercises pretest mean = 3.40; posttest mean = 5.49, & calcium intake pretest mean = 3.34; posttest mean = 4.59) (table 10) and self-efficacy (perception of exercises pretest mean= 37.05; posttest mean= 50.28, perception on intake of dietary calcium pretest mean= 46.30; posttest mean = 52.16 & FFQ pretest mean =221.32; posttest mean = 239.246) (table 26) were also noted in the paired t-test computations with statistical significance between the pretest and posttest among the subjects in the control group. But the mean differences of the variables were very less than that of the study group. Also, the mean scores in the study group were consistently very high in all the posttests. This mild increase in mean scores in the posttests of the control group could be due
to sensitization that resulted from the pretest, influence of the booklet ‘Healthy life: Happy life’ and information from other sources such as mass media, newspaper, magazines and peer influence as explained in the conceptual framework, as these factors can function as a cue to action.

The third objective of the study was to evaluate the effectiveness of Osteoporosis Prevention Programme on bone mineral density of female school teachers.

The subjects [N=170 (100%)] in the study had BMD scores ranging -1 to -2.5 (osteopenia) as pretest measurement (SG: mean BMD -1.754, CG: mean BMD -1.715) (table 29). At the end of 12 months, during posttest III (table 28), 71 (87.7%) subjects in the study group and 59 (71.1%) subjects in the control group had BMD score range of -1 to -2.5. The remaining subjects in the study group 10 (12.3%) and control group 24 (28.9%) were noticed to have osteoporosis (BMD T score < -2.5).

The mean BMD scores were reduced in the control group (-2.192) during posttest-III than in the study group (-1.891) which was statistically significant at p < 0.001 (t= 3.994) (table 30).

The present study findings explained that the number of subjects who maintained their BMD in the range of -1 to -2.5 in the study group was more than that of the control group and this could be due to the implementation of osteoporosis preventive behaviours. OPP had significantly helped the participants in the study group to maintain their BMD and prevent osteoporosis.
The effectiveness of osteoporosis preventive behavior on BMD evaluated by Kemmler, Von Stengel, Bebenek, Engelke, Hentschke and Kalender (2011) through a study supports the present findings. The researchers determined the effects of supervised long-term exercise training on ‘overall’ fracture incidence and BMD in early postmenopausal osteopenic women. 85 early postmenopausal, osteopenic women living in the area of Erlangen-Nuremberg, Germany without any medication or diseases affecting bone metabolism were assessed after 12 years of supervised exercise (experimental group, EG) or unvarying lifestyle (control group, CG). The participants were encouraged to perform exercises in two group sessions/week and two home training sessions/week. The BMD was assessed at lumbar spine and proximal femur by DEXA. The results were BMD changes at lumbar spine (EG, -0.8%; CG, -4.0%) and femoral neck (EG, -3.7%; CG, -6.7%) significantly differed between both the groups.

Another study performed by Winzenberg, Oldenberg, Frendin, De Wit, Riley and Jones (2006) provided consistent evidence that educational interventions resulted in increase in BMD. A two year randomized controlled trial was carried out to test the effects of individualized BMD feedback and different educational interventions on osteoporosis preventive behaviour and BMD in premenopausal women. The results revealed that both the educational intervention groups had similar increase in femoral neck BMD (leaflet= 1.0% p.a; group education= 1.3% p.a).

The study findings made evidenced that Osteoporosis Prevention Program was effective in preventing osteoporosis by maintaining the BMD in
female school teachers. Thus, the investigator accepted the formulated hypothesis (H7): There is a significant difference in bone mineral density among female school teachers who participate in the OPP than those who do not.

Thus, the study findings correlated with the concepts depicted in the conceptual framework as the subjects improved their health promoting behaviors which included regular practice of exercises and adequate intake of dietary calcium that led to reduction in bone loss and maintenance of BMD.

5.1 LIMITATIONS

- Investigator had no control on the osteoporosis information received by the subjects from other sources. This might have influenced the outcome variables, but it was beyond the nature of the study. The presence of control group who also had equal chance of getting such information helped to overcome such biases.

- Variation in sample size due to attrition. The causes for attrition which included pregnancy, medical leave and long leave were unavoidable.

- The self-report method utilized to collect data via questionnaires might have posed potential issues concerning the accuracy of the information but the use of standardized and validated tools limited such issues.

- The data obtained related to compliance towards the osteoporosis prevention behaviours were as verbalized by the subjects. The practices were not observed by the investigator at the home settings.
Assessment of practice of exercises using the checklist, use of 24 hours dietary recall – a gold standard method to obtain the intake of dietary calcium in addition to FFQ and measurement of BMD ensured compliance to some extent.