SUMMARY

AND

CONCLUSION
Chapter 5  SUMMARY AND CONCLUSION

With changing life style and increase in life expectancy, osteoporosis, a systematic disease characterized by low bone mass, has become a global health problem affecting 150 million men and women worldwide, the most vulnerable group being Asians of low income group, where cereals, which are deficient in calcium, form the staple diet (Shatrugana 1987). Since osteoporosis is more common in women, especially perimenopausal women, due to decrease in estrogen level while approaching menopause, and absence of it after menopause, having a major effect on the quality of life of these women, resulting in an increase in morbidity and mortality in these women hence the present nutritional based study entitled ‘role of calcium rich diet on prevention and control of osteoporosis in perimenopausal women of Bundelkhand region was conducted on 100 women of 35 years and above. A questionnaire schedule was used to study the socio economic and socio personal profile of the subjects and to know its effect on prevalence of osteoporosis. The osteopenic and osteoporotic subjects were examined clinically to assess the presence of any sign and symptom of osteoporosis. The nutritional status of the subjects was assessed directly by anthropometric measurements (Height, weight, BMI) and indirectly by assessing the nutrient intake using 24 hr recall method. The dietary habits, lifestyle factors and their effect on osteoporosis were also evaluated. Radiological (Bone Mineral Density (BMD by DEXA)) and biochemical examination of the subjects were also performed and the effect of diet counseling on these examinations were studied after 3 and 6 months. The results were analysed statistically using mean, percentage, standard deviation, correlation (r) and chi square test. The results achieved are summarized as below:
• The prevalence of osteoporosis was 26 per cent, osteopenia was 32 per cent and 42 per cent were normal.

• Age, menopausal status, age of menopause, family history was studied for socio personal profile. The results indicated that bone mass reduces with advancing age. Prevalence of osteoporosis was highest in 65 years and above age group, while osteopenia was more common in 55-65 years age group. The incidence of osteopenia /osteoporosis was higher in post menopausal women, but age of menopause has no significant relationship with severity of disease. The genetic factors showed that incidence of osteopenia /osteoporosis was higher in subjects with positive family history of osteoporosis. Age and menopausal status had a significant effect (P<0.01) negative effect on bone mineral density.

• Income /m, education, occupation, place of residence and type of family was studied for socio economic profile. The prevalence of osteoporosis was highest in low income group, in primary educated subjects, in house wives, and rural subjects living in nuclear family. The prevalence of reduced bone density in subjects of high income group was about 1/5th (20 per cent) in comparison to low income group. Income and place of residence showed a significant (P<0.01, P<0.05) effect on severity of disease, while education had a significant (P<0.05) effect on BMD only.

• The clinical examination revealed that incidences of joint pain, backache and fracture were higher in osteopenic subjects as compared to osteoporotic; however presence of all the three symptoms together was higher in osteoporotic subjects. Incidences of backache, and fracture together were more common in osteoporosis; however
incidences of both backache and joint pain were more common in osteopenic subjects. The clinical features (bone problems) had a significant (P<0.01) positive effect on the severity of disease and negative effect on bone mineral density.

- The anthropometric measurements of the subjects revealed that incidence of osteopenia/osteoporosis was highest in subjects suffering from CED grade I and grade III respectively. The incidence of reduced bone density was more in malnourished subjects, than normal or obese subjects.

- The dietary habits of the subjects revealed that maximum number of lacto ovo vegetarians and vegans were in age group of 55-65 years and 45-55 years, respectively. The incidences of osteopenia were highest in lacto ovo vegetarians and osteoporosis was highest in vegans. In non vegetarians osteopenia was higher than osteoporosis. Dietary habits did not had any correlation with either severity of disease or bone mineral density.

- The life style factors studied were physical activity, addiction to tea, tobacco, both and alcohol. The results revealed that individuals, who were leading a sedentary life style, were addicted to tea and tobacco both and had 15-30 minutes exposure to sunlight between 10 a.m to 3 pm during summer were at risk of sustaining fracture due to osteoporosis. Incidences of osteoporosis were highest in hypothyroidism and renal disorders while that of osteopenia was highest in case of GIT disorders and other diseases. Physical activity and related diseases had a significant (P<0.01) effect on osteoporosis, while all other life style factors did not show any correlation with either severity of disease or bone mineral density.
• The nutritional intake of subjects revealed that the diet of osteopenic and osteoporotic subjects was lower in calories, protein, and calcium and phosphorous in comparison to the RDA. The women under study were suffering from protein calorie malnutrition, which increases fracture risk due to decreased bone density and muscle strength. Awareness of calcium rich sources had a significant (P< 0.01) effect on bone mineral density. Among the nutrients only calcium intake had a significant (P<0.01) correlation with bone mineral density and a negative association with severity of disease.

• The radiological examination (BMD) performed by DEXA at wrist revealed that bone mineral density decreased with age and bone mineral density of even normal Indian women were lower than their North American counterparts.

• The biochemical tests performed in present study were serum calcium, serum phosphorous and hemoglobin. The mean serum calcium level of pre menopausal women was higher than their post menopausal counterparts. On the other hand the mean serum calcium level of pre menopausal women with reduced bone density was lower than their post menopausal counterparts and was below normal limits in both cases.

• In pre and post menopausal women the mean serum phosphorous level of osteoporotic subjects was highest. The serum phosphorous level of osteoporotic subjects in post menopausal women was higher as compared to pre menopausal osteoporotic subjects. All the subjects were suffering from mild anemia, and hemoglobin decreased with severity of disease.
• A significant (P<0.01) improvement was observed in serum calcium level after 3 months and 6 months of diet counseling, however in case of serum phosphorous the decrease was significant (P<0.05) only after 6 months.

• A significant (P<0.01) improvement in hemoglobin level was observed after 3 months and 6 months of diet counseling. A statistically significant (P<0.01) improvement was also observed in T score and BMD values after 3 months and 6 months both.

• Diet counseling reduced significantly (P<0.05) the incidences of reduced bone density (osteopenia and osteoporosis) after 3 months to 56 percent and further reduced significantly (P<0.01) the incidences to 53 per cent after 6 months.

From the results of present study it can be concluded that there was a higher prevalence of osteoporosis in rural women of Bundelkhand region, belonging to lower income group due to lower literacy rate and inadequacy of calories, protein, calcium and phosphorous in their diet which did not meet the RDA’s. In general the perimenopausal women were suffering from protein calorie malnutrition which make these women the most vulnerable population for osteoporosis. Calcium rich diet had a significant (P<0.01) positive effect on hemoglobin, serum calcium, T score, bone mineral density and osteoporosis. Thus diet counseling is effective in bringing about significant change in calcium intake and hence the management of osteoporosis.

**Suggestions**

As the incidence of osteoporosis and osteopenia were high in this study, there is an urgent need to diagnose the disease early by regular check ups after attaining peak bone mass at
around the age of 35 years and to impart nutrition education to women of this area to increase their awareness and to improve the consumption of calcium rich products, which can be effective in preventing or delaying the downward spiral into osteoporosis and poor health and thus help these women to enter into their wise women years with adequate calcium so that they not 'only live longer but to live healthier, with stronger bones' and be independent.

**Suggested Calcium rich food sources for people of Bundelkhand region**

<table>
<thead>
<tr>
<th>Calcium Sources</th>
<th>Nutritive Value*</th>
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<tbody>
<tr>
<td></td>
<td>Calcium (mg)</td>
<td>Phosphorous (mg)</td>
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</tr>
<tr>
<td><strong>Milk</strong></td>
<td>210</td>
<td>130</td>
<td></td>
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<tr>
<td><strong>Amaranth</strong></td>
<td>321</td>
<td>71</td>
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<tr>
<td><strong>Fenugreek</strong></td>
<td>395</td>
<td>51</td>
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<tr>
<td><strong>Soyabean</strong></td>
<td>240</td>
<td>690</td>
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<tr>
<td><strong>Rajmah</strong></td>
<td>260</td>
<td>410</td>
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<tr>
<td><strong>Colocasia Leaves</strong></td>
<td>227</td>
<td>82</td>
<td></td>
</tr>
</tbody>
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* Values per 100 gms edible portion.

Nutritive value of Indian Foods, Gopalan, C. NIN, ICMR, India