CHAPTER I

INTRODUCTION

Osteoporosis has been defined by the World Health Organization (WHO) as ‘low bone mass and micro-architectural deterioration of bone tissue leading to enhanced bone fragility and consequence of increase in fracture’. Osteoporosis is termed as a silent disease as it produces no symptom until a fragility fracture occurs. The incidence of osteoporosis in the general population is staggering. The National Institute of Health Consensus Development Panel on Osteoporosis Prevention, Diagnosis and Therapy, USA (2001) estimated that more than 10 million Americans are affected by osteoporosis and 18 million more have low bone mass. Researchers Chrischilles, Butler, Davis and Wallace (1991) estimated that 54% of 50-year-old women to have osteoporosis-related fractures during their remaining lifetime, with 40% having fracture by the time they reach the age of 70 years and the financial burden for diagnosis, treatment and rehabilitation of osteoporosis is more than $10 billion annually (Drugay, 1997).

The National Osteoporosis Foundation, USA predicted that by 2020, about 14 million people over the age of 50 are expected to have osteoporosis and another 47 million to have low bone mass. This increase in osteoporosis cases could cause the number of hip fractures to double or triple by 2040.

The statistical data related to osteoporosis prepared by the International Osteoporosis Foundation (IOF) is alarming. The data of various countries are as follows:
• Osteoporosis is responsible for more than 1.5 million fractures annually in the U.S., including 300,000 hip fractures, 700,000 vertebral fractures, 250,000 wrist fractures, and 300,000 fractures at other sites.

• Osteoporosis affects an estimated 75 million people in Europe. In 2000, the number of osteoporotic fractures was estimated at 3.79 million of which 0.89 million were hip fractures. The total direct costs were estimated at €31.7 billion (£21 billion) which were expected to increase to €76.7 billion (£51 billion) in 2050 based on the expected changes in the demography of Europe. Based on current trends in U.K, hip fracture rates may increase from 46,000 in 1985 to 117,000 in 2016 and one in two women and one in five men will suffer a fracture after the age of 50. The cost of treating all osteoporotic fractures in postmenopausal women has been predicted to increase to more than £2 billion by 2020.

• Osteoporosis affects one in four Canadian women and more than one in eight men over the age of 50 years, with one in four men and women having evidence of a vertebral fracture.

• The key statistics of Australia reveals that 2 million Australians are affected by osteoporosis of which 11% are men and 27% are women aged 60 years or more and are osteoporotic, and 42% of men and 51% of women are osteopenic. There are 20,000 hip fractures per year in Australia which will increase by 40% each decade. The total costs
relating to osteoporosis in Australia are $7.4 billion per year of which $1.9 billion are direct costs.

The upward shift in the average age of the world's population has meant an increase in the incidence and prevalence of osteoporosis with a consequent increase in its economic burden. Cumming (2002) reported that osteoporosis is a global health problem causing socio-economic burden in developed and developing countries to affluent and non-affluent societies. The report also claims that osteoporosis is high in geriatric population, as with an increase in age there will be reduction in the bone mass and this leads to more risk of osteoporosis and related fractures. According to Murray (1996), the elderly population has been mounting. Around 8,00,000 elderly population is added every month and it was projected that by 2011 there would be an increase of 269 million elderly population of above 75 years of age in the world from 163 million of 2000.

Burden of non-communicable diseases are increasing in all the developing countries especially due to lifestyle changes. India is also experiencing an epidemiological transition thus reflecting a drastic rise in non-communicable diseases (Aquigley, 2006). Osteoporosis is one such non-communicable disease that is on the steady rise in India.

The Osteoporosis Society of India (OSI) (2003) estimated that nearly 26 million people in India are suffering from osteoporosis and the number may rise up to 36 million by 2013. The fact sheet of IOF reveals that one out of eight males and one out of three females in India suffer from osteoporosis, making India one of the largest affected countries in the world.
Vaishnava and Rizvi (1994) reported osteoporosis in 141 (33%) patients out of 421 patients with hip fractures based on X-rays and iliac crest biopsies in a hospital at New Delhi.

A study done at Chennai revealed that 58.6% of the postmenopausal women were osteoporotic and any woman above the age of 50 years has the risk for vertebral (32%), lower arm (16%), hip (15%) fractures (Booklet – Cipla initiative).

Osteoporosis is an increasing public health problem worldwide. It has been estimated that in 1990, 1.7 million people globally suffered from osteoporosis hip fractures. The number might increase to 6.3 million by 2050. IOF predicted that more than half of all the osteoporosis hip fractures will occur in Asia by the year 2050. A report by World Bank (1993) pronounced that by 2013, India will be the second highest in the world after China in terms of post menopausal osteoporosis cases. These assertions identify the growing concern in recent years that with the aging population, longer life expectancy and life style changes, the prevalence of osteoporosis in India is likely to increase many folds in the near future.

According to IOF between 1990 and 2000 there was nearly a 25% increase in hip fractures worldwide. The peak number of hip fractures occurred at 75-79 years of age for the both sexes; for all fractures the peak number occurred at 50-59 years and decreased with age.

In India, accurate epidemiological data regarding osteoporosis are not available, but it is frequent in India and is common for medical practitioners
to see many patients suffering from bone fractures and other complications due to the disease (Sastry, 1992).

Alkel (1999) said that in most western countries, the peak incidence of osteoporosis fractures occurs at the age of 70-80 years but in India, it occurs 10-20 years earlier and the most of the fractures are found to occur at the age of 50-60 years.

Gupta (1996) observed that osteoporosis is widely prevalent in India and osteoporosis related fractures are responsible for the high morbidity and mortality in adult Indian women and men.

Joshi, Mangat, Balakrishnan and Mittal (1998) made a projection that in the year 2000 there were 61 million osteoporosis cases in India of which 80% were females. In addition, they estimated 500,000 hip fractures and 4.5 million spinal fractures in women’s above 60 years.

It has been projected that a woman's life time risk of hip fracture equals the combined risk of breast, uterine, and ovarian cancer. So also, the risk of dying from hip fracture is probably higher than the mortality from breast cancer. The burden of morbidity from osteoporosis has significant medical, social and financial implications. In addition, fractures of hip are associated with 20% excess mortality (Osteoporosis Society of India).

Krista Kotz, Stephane Deleger, Richard Cohen, Alisa Kamigaki and John Kurata (2004) found out that women with osteoporosis are at higher risk of developing problems with physical frailty and difficulties with activities of
daily living, and reduced quality of life in terms of going out and enjoying free time.

The usual fracture sites associated with osteoporosis are the vertebra, hip, or wrist. The lifetime risk for any of these fractures is 39.7% for women. These fractures can lead to considerable disability. Hip fractures usually require lengthy hospital stays, often followed by permanent disability and dependence. Vertebral fractures can lead to disfigurement, chronic back pain, and functional loss.

Cummings, Kelsey and Nevitt O'Dowd (1985) stated that vertebral fractures occurring as a result of osteoporosis are associated with loss of height, pain, and deformity, as well as significant performance impairments in physical, functional, and psychosocial domains in older women. Further there is a chance of 20% increased mortality within the year after the fracture.

Recent observational studies showed that there is a huge gap between occurrence of osteoporosis fracture and its proper diagnosis and management (Giangregoria, 2006). This observation is consistent with the findings of an IOF survey conducted in 11 countries which showed that denial of personal risk among postmenopausal women was due to lack of dialogue about osteoporosis with their doctors, and restricted access to diagnosis and treatment before the first fracture resulting in underdiagnosis and undertreatment of the disease.

It is estimated that only one third of osteoporosis vertebral fractures come to clinical attention and underdiagnosis of vertebral fracture is a
worldwide problem. The proportion of vertebral fractures that go unrecognized is as high as 46% in Latin America, 45% in North America and 29 % in Europe/South Africa/Australia.

Osteoporosis poses a huge economic and social burden on societies worldwide and this burden will grow if left unchecked. Such a scenario implies an urgent need for early detection, prevention and treatment. The diagnosis and clinical management of osteoporosis relies mainly on the measurement of bone density. During the last few decades several techniques have been developed for the measurement of bone mineral density (BMD). Most of these techniques are costly, and another disadvantage is of ionizing radiation. The use of acoustic energy in the form of ultrasound wave has been suggested as a possible choice for the assessment of bone integrity and for the determination of the response of the bones to mechanical loads in order to predict the risk of fracture (Langton, C.M., 1990). Ultrasound involves no radiation and is relatively simple to implement and accounts for the widespread interest it has received recently. The widely used measurement site is calcaneun. It is validated by the fact that it contains 75-90% cancellous bone by volume (Vogel, 1988 and Pluskiewicz, 1999).

Cancellous bone is eight times more metabolically active than cortical bone hence, age and disease related bone loss are very much apparent at sites with high percentage of cancellous bone. Being a weight bearing bone calcaneus is very active in remodeling process, which shows changes within bone tissue earlier than compact bone. The presence of less soft tissue on
calcaneous bone is an added advantage for the measurement of bone mineral density.

Despite such advancements in the diagnostic field of osteoporosis the availability and utilization of such resources remain poor. In most of the developing countries there is a lack of screening programs and diagnostic facilities for osteoporosis (Tucci, 2006).

Osteoporosis is a preventable disease yet, there is an alarming rise in number of people with this disease and its consequences. Population based interventions on health promotion; macro policies at primary level are required to prevent and to manage the non-communicable diseases (Greenberg, 2005).

The current scenario mandates formulation of policies and strategies by the Government for the prevention and management of osteoporosis at the grass root level. A nurse being a health care personnel shares the responsibility in the formation of a healthy society.

1.1 NEED FOR THE STUDY

‘We cannot continue to let people become ill when we have the means to keep many people well, particularly when problems are environmentally and behaviorally induced’.

- Pender.

Osteoporosis is a major and growing public health problem in both the sexes, and particularly in women (Cooley and Jones, 2001). IOF claims that
Osteoporosis affects one in three women and one in five men over 50 years of age. More than 200 million women worldwide have osteoporosis. A population based study on osteoporosis by Melton (1996) indicates that 30.3% of white American women above the age of 50 years have osteoporosis.

Osteoporosis can begin as early as age 25, yet the majority of those affected by it are post menopausal women (Leslie and St Pierre, 1999). In women, bone loss accelerates after menopause because the ovaries stop producing estrogen, the hormone that protects against bone loss.

Pande (2002) reported in his population based study on osteoporosis that 30.3% of women over the age of 50 years have osteoporosis. Shatrugna (2005) conducted a study at Nagpur which included 261 women and 177 men. The bone mass of the samples were estimated using digital X-ray radiogrammetry. The study findings revealed that 50% of women and 36% of men over 50 years of age were found to have low bone mass.

Indian women have a low BMD than their western counterparts (WHO, 1994). Although low BMD confers increased risk for fracture, most fractures occur in postmenopausal women and elderly men at moderate risk (IOF). Even low bone density is prevalent among healthy younger adults (Pandey, 2002). Although BMD is lost most rapidly postmenopausally, it has also been shown that premenopausal women have significant age-related BMD loss (Slemenda, Sowers and Bainbridge, 1996) and that premenopausal bone mass contributes to the risk of fracture in later life (Riis, Hansen, Jensen, Overgaard and Christiansen, 1996).
Low BMD is the determinant of osteoporosis. Low bone mass is because of poor calcium intake, lack of physical exercises and a sedentary lifestyle (Sharma, 2006). Calcium intake, physical activity and lifestyle are modifiable risk factors of osteoporosis and with educational strategies focusing on these risk factors, the impact of osteoporosis can be reduced (Blalock, 2000). IOF stated that physical activity and fitness reduce risk of osteoporosis, fracture and fall related injuries.

Recent studies have examined the importance of exercise for maintaining bone mass. In general, regular physical activity started early in life ensures adequate bone strength and reduces the risk of falling.

According to Dombrowski (2000), physical activity during adolescence and early adulthood has been reported to be more strongly related to BMD when measured during the premenopausal period whereas another expert Sharkey (2000) pointed out that exercising later in life, during postmenopausal period may help to maintain bone mass.

On the other hand, poor dietary calcium intake another risk factor for osteoporosis is widely prevalent among Indians. It is clear from the fact that the median dietary calcium by the adult Asian population is approximately 450mg/day in contrary with the Indian Council of Medical Research (ICMR) expert group’s (2009) recommendation of 600mg/day for an adult Indian. It is possible that a dietary deficiency of calcium beginning in early life leads to a lower peak bone mass and consequently osteoporosis at an early age (Gupta, 1996).
Initiation of Osteoporosis Education Program to the general population leads to improvement in the understanding of the disease and its preventive measures. Kasper, Peterson and Allegrante (2001) said that the success of any prevention program is based on the understanding and knowledge gained by the population about the disease. The pre and posttest assessment of knowledge, before and after the implementation of any Osteoporosis Education Program will yield necessary data related to the success of the intervention program.

Osteoporosis is a debilitating disease that often goes undiagnosed in its beginning stage and people seek medical attention only after a fracture occurs, people live with the disease as it brings morbidity than mortality. Thus it takes a huge personal and economic toll. In Europe, the disability due to osteoporosis is greater than that caused by cancer and is comparable or greater than that lost to a variety of chronic non communicable diseases such as rheumatoid arthritis, asthma and high blood pressure related heart diseases (Johnell O. Kanis, 2006). These statements emphasize the need for osteoporosis prevention program to maintain the quality of health of the people and economics of the country.

It is evident through the available statistics and research studies that women are at higher risk for the development of osteoporosis and it is a major cause of fracture in elderly women, resulting in pain and disability. Hence to have a better quality of life and to avoid fracture, bone health should be taken care of. Early screening for BMD and educating young women is recommended to prevent or delay the onset of osteoporosis. Osteopenia is a
stage prior to osteoporosis, at this stage, if proper care through calcium rich diet and physical exercises is emphasized; it prevents bone loss and maintains bone health. Educating young women about what may predispose them to a high risk of osteoporosis in later years would benefit a lot in preventing the disease. Piaseu, Belza and Mitchell (2001) supports this concept by saying that once young women are educated on the risks of osteoporosis and prevention behavior, they will be able to act on the evidence which suggests that heightening of bone mass in young women through increased calcium intake and increased exercise may help to prevent osteoporosis in later in life.

Also, Poo (1995) pointed out the need for consistent and widespread use of secondary prevention on whom intervention may inhibit disease progression and the risk of rapid bone loss by providing early management.

The success of any ‘Educative Prevention Program’ depends on the participants for whom the prevention strategies are targeted. The participants should have confidence in their abilities to modify their life style to have a desired health as educated by the investigator. The theory of self-efficacy proposes that individual beliefs about personal capabilities predict behavior performance. As Whitehead (2001) stated that the strength of social cognitive theory lies in its ability to highlight an individual’s reasons for considering and possibly adopting any health related behavioral change.

In general, most of the osteoporosis prevention programs are targeted on postmenopausal women. There are only a few research studies about the use of educational intervention for osteoporosis prevention in young women
(Ausenhus, 1998). Therefore, research is needed to find out the effectiveness of Osteoporosis Prevention Program among young women.

According to Polit (1999) ‘a population is the entire aggregation of cases that meet a designated set of criteria’. Considering the criteria such as practical concerns, homogeneity of the samples, cost, and the vulnerability of the population to have low BMD, the present study has included female school teachers. The teaching fraternity use much of their productive time in the schools by standing or sitting. Sedentary life style takes the priority in the list of modifiable risk factors of osteoporosis. Being an educated group the knowledge on osteoporosis is expected to be good. But in reality, the emphasis given by the media, health care institutions, awareness programs, screening programs, research studies, government policies and protocols to other non communicable diseases is not given to osteoporosis. Hence, there exists a dilemma in the knowledge status on osteoporosis among the people and school teachers too. Also, knowledge on any disease is expected to be high among the educated people but, that is not accepted in case of osteoporosis. Woo, et al. (1999) quoted that a higher level of education is associated with a healthier diet and lower cardiovascular risk. However, inconsistent findings between educational level and osteoporosis have been noted (Lauderdale, 2001).

Also, the demand of more research into this field becomes mandatory to study the Indian population and the disease trend in detail to ensure healthy nation. Gupta (1997) stated that although osteo specialists note that it is important to have data on actual calcium and vitamin D intake, in reality this
information is usually lacking. In fact many experts would agree that, overall, there is a lamentable lack of accurate data on osteoporosis and the knowledge and practice of its preventive measures.

Osteoporosis being a public health problem, nurses play a vital role in preventing this disease thus curtailing its societal ravages. Presently, a paradigm shift in health care from disease treatment to disease prevention and wellness promotion has occurred (Thomson and Kohli, 1997). The American College of Nurse Practitioners, as well as the American Academy of Nurse Practitioners have identified health promotion as a primary function of Advanced Practice Nurses. Many organizations, to include the WHO, have acknowledged the importance of nurses’ roles in this shift. WHO (2000) asserted that ‘nurse and midwives have key and increasingly important role to play in society’s efforts to tackle public health challenges, as well as in ensuring the provision of high quality, accessible, equitable, efficient and sensitive services which ensure continuity of care and address people’s rights and changing needs’. In concern with this, nurses are purported to value and have an enthusiasm for health promotion. Focused measures like osteoporosis preventive educational programs are needed to be implemented to help the people to understand the determinants of bone health, and prevent bone loss. Thus, the potential burden of osteoporosis can be reduced. This realization has strongly motivated and prompted the investigator to assess the effectiveness of Osteoporosis Prevention Program on knowledge, self-efficacy and bone mineral density among female school teachers utilizing Nola J. Pender’s health promotion concepts.
1.2 STATEMENT OF THE PROBLEM

A study to evaluate the effectiveness of Osteoporosis Prevention Programme on knowledge (osteoporosis risk factors, exercises and calcium intake), self-efficacy (perception and practice of exercises & intake of dietary calcium) and bone mineral density among female teachers in selected schools of Kanchipuram district.

1.3 OBJECTIVES

The objectives of the study were to

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

2. 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.

3. evaluate the effectiveness of Osteoporosis Prevention Programme on bone mineral density of female school teachers.
1.4 HYPOTHESES

H1: There is a significant difference in knowledge on osteoporosis risk factors among the female school teachers who participate in the Osteoporosis Prevention Programme (OPP) than those who do not.

H2: There is a significant difference in knowledge on exercises among the female school teachers who participate in the OPP than those who do not.

H3: There is a significant difference in knowledge on calcium intake among the female school teachers who participate in the OPP than those who do not.

H4: There is a significant difference in perception on exercises among the female school teachers who participate in the OPP than those who do not.

H5: There is a significant difference in perception on intake of dietary calcium among the female school teachers who participate in the OPP than those who do not.

H6: 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.

H7: There is a significant difference in bone mineral density among female school teachers who participate in the OPP than those who do not.
1.5 OPERATIONAL DEFINITIONS

Effectiveness

Evaluation of the outcome of OPP on knowledge (osteoarthritis risk factors, exercises & calcium intake), self-efficacy (perception on exercises, perception on intake of dietary calcium, practice of exercises & practice of intake of dietary calcium) and bone mineral density.

Osteoporosis Prevention Programme

It is a teaching process offered to the study group that consists of two sessions of 30 to 40 minutes each for two consecutive days. The first session includes lecture cum discussion on osteoporosis - its definition, causes, risk factors, disease process, investigations, management and prevention which focuses on dietary calcium and exercises. The second session comprises demonstration of exercises and issuing of the booklets ‘Healthy life-Happy life’ and ‘Invest on your bones’ followed by reinforcement on the 15th day after intervention and first week of every month after the posttest-I.

Knowledge

The responses on the details of osteoporosis risk factors and its preventive measures which include exercises and calcium intake as ascertained using the Osteoporosis Knowledge Test (Katherine Kim, Mary Horan and Phyllis Gendler, 1991).
Self-efficacy

An individual’s perception of self capabilities and the level of adherence in implementing the components of osteoporosis preventive measures which include the intake of dietary calcium and practice of exercises that comprise of balancing, weight bearing, strengthening and resistance exercises as measured by (i) Osteoporosis self-efficacy tool (Katherine Kim, Mary Horan and Phyllis Gendler, 1991), (ii) Assessment of intake of dietary calcium and (iii) Assessment of exercise.

Bone mineral density

Assessment of the left calcaneal bone mass of the study participants through Quantitative Ultra Sound (QUS) diagnostic test during the sample selection process and reassessment following the interventions at the end of 12 months.

Female teachers

Women educators employed in government schools whose left calcaneal BMD measurement T-score ranges from -1 to -2.5.

1.6 ASSUMPTIONS

- Awareness of health risk promotes desirable behaviour
- Self capabilities influence behavior
- Need based behavioural modification prompts adherence
- Reinforcement enhances motivation