REVIEW OF LITERATURE

The review of literature pertaining to the study on “Nutritional status of Post menopausal women” is discussed under the following headings.

2.1 Health Profile of women
2.2 Post menopause - Physiological and emotional problems
2.3 Common diseases in Postmenopausal women
2.4 Dietary habits of Post menopausal women
2.5 Osteoporosis in Post menopausal women
2.1 HEALTH PROFILE OF WOMEN

Health is a common theme in most cultures. In fact, all communities have their concept of health, as part of their culture. In spite of that, health continues to be a neglected entity. At the individual level, it cannot be said that health occupies an important place, it is usually subjugated to other needs defined as more important, such as wealth, power, prestige, knowledge and security. Health is often taken for granted, and its value is not fully understood until it is lost.

According to Ministry of Human resource Development (1998) health is something holistic and does not exit in isolation but is an interplay of biological, psychological and social factors. Discrimination against women in various spheres of life grossly affects their health.

Interest in the subject of women, health and development has increased markedly as the status and many contributions of women in the field of health are recognised to be vital not only for the health of the population as a whole but also its prospects for sustainable development. (WHO, 1992)

Women have different hormonal and structural constitution than men. There are differences in their nutritional, functional and emotional build up. Even the environmental and social surroundings affect the two sexes differently. (Jeyaraj, 2001)

A woman’s health is shaped by her environment; that is, where she lives, works, learns and plays. Despite living 6.4 years longer, on average, than men, women suffer poorer health outcomes and greater disability for disease. (Acheson, 1997)
Low wages, long erratic working hours, a deplorable working environment absence of workers union, coupled with the several survival and reproductive task can only have adverse consequences on women health (Prasad and Srinivas, 2003).

According to Sen et al (2002) Unequal access to and control over resources and consequent unequal social power influence the ability of women and men to protect their own health. For example, women are often less able than men to protect themselves against HIV/AIDS, because they do not have equal power to decide whether to have sex or to have ‘safe’ sex. This is because women's socio-economic status is generally lower than that of their male partners, which limits their ability to negotiate with them.

A low self perception of women as well as the culture of silence in which they are brought up makes them endure suffering and this further reduces their access to health care. Taught to believe that menstruation is dirty, a women is hardly in a position to seek medical intervention for white discharge or for menstrual disorders. (Janaki, 2003)

Women suffers from a variety of common gynaecological problems including menstrual dysfunctions at peri-menarchal and peri-menopausal age. Women often work long hours, increasing their exposure to illness and injuries. A large proportion of women are engaged in agricultural work. This can expose them to worm infestations and aggravate anaemia. Exposure to pesticides and chemical fertilizers can also result in abortion and still birth (Goel, 2004).

A small but significant sample of women develops post-partum psychoses, which is often neglected (chandha, 2001).

Over the past few years, the definition of women's health has evolved beyond reproductive issues and now targets all health concerns experienced by women across lifespan and in the social context of their lives (Weisman, 1997)
Jaiprakash (1999) opines that malnutrition is the index of poverty in developing countries. Malnutrition is disproportionately high among women. Ageing, in most developing countries bring control over one's life that puts a woman in an enviable position.

Approximately 17.9 percent of women in the community report Common Mental Disorder (CMD). There is a strong correlation between gynaecological morbidity and CMD. More women than men use the so-called indigenous healing systems and possessed, or go into mystical trance. (Khanna et al 2002).

A study on the general health status of tribal women in India, points out a remarkably low health status than that of Indian women in general. It emphasize the greater need for under taking region specific study of status and role of women which alone will help planning for their welfare in a more effective and meaningful way (Basu, 2001).

Narayan (1999) opines that assessment of women's health needs a new conceptual frame work that views woman as a person in her own right.

There are only few studies on Health status of women as such in Kerala while discussing the health status of women in India, Vani (1996) feels that the government has failed to meet the health care needs of its female population. Nutrition of women, maternal mortality and occupational health hazard of working women, mental health and health problems caused by violence and other social factors and women's access to health care systems are the key areas to which the Government and non-Governmental organisations must concentrate on.

Defining quality in women's care and developing a research agenda to measure women's quality of care are critical to improving the health care and health status of women and facilitating changes in policy. (Weisman, 2000).
The major infections causes of deaths and Disability - Adjusted Life Years (DALYs) lost among the poor are respiratory infections (13.4%) diarrhea diseases (11.3%) and the childhood cluster of infectious diseases (7.8%). These account for nearly one third of all deaths among the world’s poor and for proportionately more deaths among females than among males. Among the poorest 20% people in the world, infectious diseases are responsible for 6.3 % more of all female deaths and 7.5% more of all female DALYs lost compared with men (Gwatkin and Guillot, 2000).

The ten leading causes of death in US women of all ages and races are (in descending order) diseases of the heart, malignant neoplasms, cerebrovascular disease, chronic obstructive pulmonary disease, pneumonia and influenza, diabetes, accidents, Alzheimer’s disease, kidney disease and septicemia (National Centre for Disease Control and Prevention, 1997).

One in ten women 45 to 64 yrs of age has some form of heart disease and this number increases to about one in four women over 65. Each year 500,000 American women suffer heart attacks on all to frequent outcome of CHD. (National Women Health Report, 2003).

The Majority of health problems of women in the developing world could be solved by better nutrition, clean water, sanitation, access to maternal care and family planning, prevention of infections, immunization and the availability of essential drugs. Women’s health, their status and their multiple contributions are pivotal links between the health of a population and its prospects of sustainable development prospects. Women’s health is influenced by biological, environmental, social, economic and cultural factors. Information on health care and family planning and opportunities for women to benefit from it also plays an important part, together with women’s participation in their own health and health for all (WHO, 1992).
Enhanced social support may improve health and health care and increase success in maintaining health behaviours and self management of chronic disease. Health promotion activities developed for women must focus not only on diseases that are more prevalent or more serious in women, but also on priority health issues identified by women themselves, the diversity of women, the determinants of health, and above all, the impact of gender on health. (Jacobs et al 1998).

Nutritional anaemia continues to be widespread amongst women of reproductive age. A recent estimate of the prevalence is that half of the pregnant women and one third of non-pregnant women in the world are anaemic the highest prevalence still occurring in Indian sub-continent. (WHO, 1992).

Optimal nutrition and physical activity promote health and reduce the risk of chronic disease to optimize women’s health, it is important for dietitians to assess a woman’s living environment, support systems, and social networks for promoting behaviour changes. Enhanced social support may improve health or health care and increase success in maintaining healthy behaviour and self management of chronic disease. Health promotion activities developed for women must focus not only on diseases that are more prevalent or serious in women, the determinants of health and above all, the impact of gender on health. (Costello et al 1998).

Women’s health has recently become a major clinical field, as well as relevant public issue. Providing health care to women is complex and challenging and requires the coordinated effort of a multidisciplinary team of health care professionals. To succeed in this effort health care professionals need to practice good communication skills, have access to evidence-based information and be able to translate scientific evidence into their clinical practice. As patients, women should have easy access to the latest evidence-based information designed to help them
make the right decisions about their care and the care of their family members. (Kasper, 2002)

There is a need of increasing women’s access to appropriate, affordable and quality health care throughout their life span and strengthening preventive programmes that promote women’s health. Investing in women’s health has strong synergistic effects on other dimensions reports Goel (2004).

Multidisciplinary action in the form of programs to promote women’s health is required, comprising preventive aspects related to coronary heart disease, to improve the quality of life in women feels Oliveira and Filho (2005).
2.2 POSTMENOPAUSE – PHYSIOLOGICAL AND EMOTIONAL PROBLEMS

From menarche to menopause there are lot of biological changes in women's body and its effect on mind and health in totality need to be looked carefully (Murthy, 2003).

Menopause is defined as the time at which menstruation ceases, where as climacteric is the phase of waning ovarian activity and may start two or three years before the menopause and continue for two to five years after it. The climacteric is thus a phase of adjustment between active and inactive ovarian function and may occupy several years of a woman’s life. (Padubidri et al 1999)

According to Beckar et al (2002) Menopause is defined as the cessation of menses, represents an important developmental milestone in a woman’s life.

Menopause begins after a woman’s last period. A woman is considered to be in menopause after she hasn’t menstruated for a full year. But before that happens, women go through a phase known as the climacteric, or perimenopause. At this time, the ovaries get smaller and produce less estrogen. This drop in estrogen level causes the hot flashes, night sweats, vaginal dryness, skin changes, sleep difficulties, mood swings depression and weight gain experienced by some women. The drop in estrogen often alters a woman’s period, which may become heavier or lighter, longer or shorter or irregular. (Hansen, 1995)

Menopause is a process and not a disease opines Hansen (1995). Most women hit menopause around age 51. Some women go through it earlier, an estimated 1 percent do so before age 40.

Menopause usually occurs between the ages of forty-eight and fifty-two. Extreme fatigue and drowsiness are also symptoms of type II diabetes in
postmenopausal women. "High doses of estrogen and progesterone require larger
doses of insulin than low doses of estrogen and progesterone". (Rosenthal, 2005)

According to Ramkumar (1990) menopause is the physiological end of
reproductive life of a woman between 45 to 55 years of life, but may occur earlier.
There are many physical and emotional symptoms during this period such as hot
flushes, night sweats, anxiety, tension and mood-swings. These are due to the
changes in the imbalance of internal hormonal Milan and are self-limiting.

Menopause and Depression in women bring mild mood changes and
symptoms of anxiety which do not amount to psychiatric disorder may be present for
a few years prior to the onset of the natural menopause and occur following surgical
menopause. There is no consistent symptom complex of psychological features in
association with this stage of a woman’s life. (Kohen, 2000)

Nicolsmith (1996) in a critical review of the research published on menopause
concluded that there is not sufficient evidence at the present to support the view that
menopause causes depression. However women with a previous history of mood
disorder that is cyclic in nature or associated with reproductive events may be at a
risk of depression in the menopause. (Stein et al 1997)

The commonest and most noticeable symptoms are hot flushes and sweating
which are the hallmark of the climacteric in 85% women. Paraesthesia, which takes
the form of sensations of pins and needles in the extremities is again extremely
common. Menopausal arthropathy, osteoarthritis, fibrositis, backache and vertebral
disc lesions are all common complaints at menopause. Diminution in the calcium
content in the bone during advancing age is called osteoporosis. At the age of 40,
total bone calcium amounts to 1200g when the critical level of 750g is reached the
women becomes susceptible to fracture. Oestrogen deficiency at menopause can
cause urethral caruncle, burning micturition without infection and stress- incontinence
due to poor vascularity around the internal urinary sphincter. Ovaries show an increased refractory state to gonadotropins and ovulation finally cease after which the ovary atrophies with gradual decrease in oestrogen production. Menopausal ovary measuring over 8 cm$^3$ is abnormal. Fifteen years after menopause the ovary should measure less than 2 cm$^3$. (Padubidri et al 1999).

The hot flush is described as a heat or warmth sensation of the skin, often accompanied by other symptoms such as sweating. The majority of both post menopausal and perimenopausal women report hot flush symptoms. (Yonus, 2003)

Menstrual cycle irregularity occurs in over 50 per cent of women in the menopausal transition and is often associated with abnormal uterine bleeding which may present as irregular, heavy or persistent menstrual flow (Arroyo and yeh, 2005)

Many women experience sexual dysfunction both prior to and after the menopause. Female sexual dysfunction is common and increases in prevalence through the menopausal transition, ultimately affecting nearly 1 in 2 post menopausal women (Gutmann, 2005)

The sleep characteristics in postmenopausal women indicated that better cognitive performance was associated with more rapid eye movement sleep. The increase in sleep complaints after menopause was not associated with sleepiness or disturbances in objective sleep quality, mood or cognitive performance (Kalleinen et al 2008)

A survey conducted by Susan (2003) reveal that many women are confused about menopause and suffering symptoms that have a large impact on quality of life. The National Consumers League (2003) which is dedicated to more doctor - patient dialogue, commissioned a survey of women's attitude towards menopause and its symptoms involving over 800 women aged from 45 to 59. They found that 17
percent have severe symptoms like mood swings, irritability, crying and decreased sex drive. But nearly half have only mild or no symptoms. Around 61 percent reported hot flushes. Around a third did not discuss symptom with their doctors and many women felt that symptoms were trivialized. They also complained that doctors left treatment decisions - such as whether to take hormone replacement up to them, where they would prefer a joint approach.

Bosworth et al (2003) feels that health care providers treating women going through menopause should be aware that the stress response to the menopause transition is multifactorial and is associated with women's individual personalities and coping styles.

In a Danish study (Stoppard, 1998) of menopausal women, one third of those interviewed continued to have hot flushes for ten years after their last period and in the most severe cases, women had hot flushes six or seven times every hour. Two out of three women suffered hot flushes well before their last menstrual period, but for most the frequency increased dramatically at the menopause and continued for about the next five or six years. The discomfort experienced during a hot flush is unique - it is not the same as being over - heated. In one study investigators tried to induce hot flushes by using hot - water bottles and blankets but discovered that applying direct external heat does not produce the same dramatic changes in heat rate and blood pressure as a menopausal flush does.

Robinson et al (1996) in a review of five cross cultural studies found enormous differences in the experience of the menopause not only among women from different cultures but also with in the same culture. Reported menopausal symptoms were influenced by a combination of physical changes cultural factors and individual perceptions and expectations.
The study was to investigate the trace mineral status in postmenopausal women and the influence of hormonal replacement therapy on this status revealed that hormonal replacement therapy provides beneficial effects on trace mineral status related to menopause. (Arnaud et al 2002)

In a study by Stoppard (1998) to investigate the changes due to collagen deficiency in Post menopausal women revealed the following:

**CHANGES DUE TO COLLAGEN DEFICIENCY**

<table>
<thead>
<tr>
<th>Skin</th>
<th>Dryness or oiliness, wrinkles, flaking, bruises easily, wounds heal slowly, patches of brown pigmentation, prominent veins.</th>
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</thead>
<tbody>
<tr>
<td>Nails</td>
<td>Brittleness, white spots, splinter hemorrhages.</td>
</tr>
<tr>
<td>Eyes</td>
<td>Dryness, dark circles under eyes, small yellow lumps of fat on the white part of the eyes, night vision deteriorates, red blood vessels around the corners of the eyes.</td>
</tr>
<tr>
<td>Gums</td>
<td>Bleeding and sponginess, recession leaving tooth roots exposed, infection and periodontal disease, which causes bad breath.</td>
</tr>
<tr>
<td>Hair</td>
<td>Dullness, dryness, oiliness, split ends, poor growth, thin patches, dermatitis of the scalp, hair loss, dandruff.</td>
</tr>
<tr>
<td>Mouth</td>
<td>Cracks on the corners of the lips, mouth ulcers that are slow to heal</td>
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<tr>
<td>Tongue</td>
<td>The sides may become scalloped and the tongue thinner and smoother.</td>
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</tbody>
</table>

Limiting the intake of foods and drinks that trigger hot flushes can help reduce their intensity. These include sugary, salty, spicy or hot dishes, chocolate, alcohol, coffee, tea and cola drinks. Avoiding large meals (small, regular ones are better) and inclusion of soya-based products, which has oestrogenic properties - in the diet will help. Foods rich in vitamins A, B, C and E in addition to potassium, zinc, magnesium,
bioflavonoid, iron and calcium. Drinking two liters of water a day will be healthy. (Stoppard, 1998)

Regular aerobic exercise helps to strengthen a weak heart and will also help to reduce high blood pressure, which can lead to heart problems. Exercise can help hot flushes and night sweats, which can often be a contributing factor to menopausal emotional problems and depression. Exercise can lift the mood and produce an “exercise high” that can last up to eight hours. Yoga, with its unique combination of exercise and relaxation techniques, could also work well. (Stoppard, 1998).
According to Stoppard (1998) certain vitamins will benefit menopausal complaints they include the following:

### VITAMINS THAT WILL BENEFIT MENOPAUSAL COMPLAINTS

<table>
<thead>
<tr>
<th>VITAMIN</th>
<th>SOURCE</th>
<th>COMPLAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Carrots, spinach, turnips, apricots, liver, cantaloupe melon, sweet potatoes</td>
<td>Excessive menstrual bleeding, Cervical abnormalities, Fibrocystic disease and cancer of the breast, Leukoplakia and other skin conditions.</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>Green leafy vegetables, nuts, peas, beans, liver and kidney</td>
<td>Cervical abnormalities and cancer, Osteoporosis, Diabetes mellitus</td>
</tr>
<tr>
<td>Vitamin B3</td>
<td>Meat and poultry, fish, pulses, whole wheat, bran</td>
<td>Hyperlipidaemia (high concentration of blood fat), Hypoglycaemia (low blood sugar)</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>Meat and poultry, fish, bananas, wholegrain cereals, dairy products</td>
<td>Cervical abnormalities and cancer, Diabetes mellitus</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>Fish, poultry, eggs and milk, B12 enriched soya products (no vegetable contains B12)</td>
<td>Anxiety, Depression, Mood swings, Fatigue</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Citrus fruits, strawberries, broccoli, green peppers</td>
<td>Excessive menstrual bleeding, Cervical abnormalities and cancer.</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Sunlight, oily fish, fortified cereals and bread, fortified margarine</td>
<td>Poor calcium absorption, leading to an increase in the risk of osteoporosis</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Vegetable oils, green leafy vegetables, cereals, dried beans wholegrains,</td>
<td>Hot flushes, Anxiety, Vaginal problems (e.g. dryness), Hypothyroidism, Atherosclerosis, Osteoarthritis, Fibrocystic disease of the breast.</td>
</tr>
</tbody>
</table>

(Stoppard, 1998)
According to Stoppard (1998) certain minerals will benefit menopausal complaints; they include the following:

### MINERALS THAT WILL BENEFIT MENOPAUSAL COMPLAINTS

<table>
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<tr>
<th>MINERAL</th>
<th>SOURCE</th>
<th>COMPLAINT</th>
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<tbody>
<tr>
<td>Calcium</td>
<td>Milk and milk products, dark gareen leafy vegetables, citrus fruits, dried peas and beans</td>
<td>Osteoporosis, Hyperlipidaemia (high concentration of blood fat), Hypertension (high blood pressure)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Green leafy vegetables, nuts, soya beans, wholegrain cereals</td>
<td>Osteoporosis, Fatigue, Diabetes mellitus, Coronary artery disease, Anxiety, Depression</td>
</tr>
<tr>
<td>Potassium</td>
<td>Orange juice, bananas, dried fruits, peanut butter, meat</td>
<td>Fatigue, Heart disease, Hypertension (high blood pressure), Anxiety, Depression</td>
</tr>
<tr>
<td>Zinc</td>
<td>Meat, liver, eggs, poultry, seafood</td>
<td>Osteoporosis</td>
</tr>
<tr>
<td>Iron</td>
<td>Nuts, liver, red meats, egg yolk, green leafy vegetables, dried fruits</td>
<td>Anaemia due to excessive menstrual bleedings</td>
</tr>
<tr>
<td>Iodine</td>
<td>Seafood, fish, seaweed</td>
<td>Hypothyroidism, Fibrocystic disease of the breast</td>
</tr>
<tr>
<td>Chromium</td>
<td>Meat, cheese, wholegrain breads</td>
<td>Hypoglycaemia (low blood sugar)</td>
</tr>
<tr>
<td>Selenium</td>
<td>Seafood, meat, wholegrain cereals</td>
<td>Fibrocystic disease of the breast, Breast cancer</td>
</tr>
<tr>
<td>Manganese</td>
<td>Nuts, fruits and vegetables, wholegrain cereals</td>
<td>Atherosclerosis</td>
</tr>
<tr>
<td>Bioflavonoids</td>
<td>All citrus fruits, especially the pulp and pith</td>
<td>Hot flushes, Excessive menstrual bleeding, vaginal and other emotional problems Anxiety, Irritability</td>
</tr>
</tbody>
</table>

(Stoppard, 1998)
Women should approach middle age with good nutritional status and in good physical condition. A variety of foods should be consumed to meet nutritional requirements, and if the diet is restricted, supplements should be added. (Moghisssi and Evans, 2003).
2.3 COMMON DISEASES IN POSTMENOPAUSAL WOMEN

Disease is the structural and functional abnormality with the implication that the abnormality produced has the potential of covering the quality of life contributing to a disability, illness or leading to death. Diseases can be understood as a failure in and of the individual, an isolatable ‘thing’ that attack the physical machine more or less arbitrarily from ‘outside’ preventing it from fulfilling its essential ‘responsibilities’. Two keys concepts in describing health and disease in populations are in prevalence. (Wasir, 2001)

Women under eighteen and those after menopause are more susceptible than women of reproductive age, as vaginal mucus provides a effective barrier during the reproductive years (Forrest, 1991).

Postmenopausal women have reached an age when the incidence of chronic health conditions becomes more prevalent. The health consequences of obesity include increased risk of heart disease, hypertension, diabetes, sleep apnea, cancer, osteoarthritis, and mental health problems. (Dannis, 2002)

Cardiovascular disease

Projections by World Health Organization for the 1990’s gave estimates of the proportions of smokers as 47 per cent among men and 12 per cent among women. Women especially of middle age who smoke have an increased cardiovascular diseases, including Coronary Heart Diseases, ischemic stroke and sub-arachnoids haemorrhage (Ernster et al., 2000).

Men are more prone to heart attacks than women in pre-menopausal phase. Post menopausally the incidences are equal. Men suffer from about 8 times the rate of CHD. Men have a greater risk of heart attack than women and they have attacks
earlier in life. Even after menopause, when women's death rate from CHD increases, it is not as great as men's reports American Heart Association (1999).

Jhala et al., (1999) found a highest incidence of Coronary Artery Disease among women in the age group of 51-60 years. Overall mortality of Coronary Artery Disease was 3.99 per cent being 1.83 per cent of Angina Pectoris and 5.39 per cent of Myocardial Infarction.

Menopausal women with type II diabetes are also at greater risk for cardiovascular disease and osteoporosis. “Cardiovascular disease is the number one killer of women with diabetes, suppressing both breast and ovarian cancer”. (Childs, 2005)

A study conducted to find the risk of coronary heart disease among three groups namely pre-menopausal perimenopausal and postmenopausal women indicated serum vitamin E level was higher in peri and postmenopausal women then in pre-menopausal women. This may be due to an increase in total cholesterol levels in the two groups. However an increase in Low Density Lipoprotein- Cholesterol, Very Low Density Lipoprotein- Cholesterol and the ratio of Low Density Lipoprotein-Cholesterol to High Density Lipoprotein-Cholesterol was noticed in postmenopausal women, when compared to that of pre-menopausal women. There was also a significant increase in serum triglycerides in peri and postmenopausal women when compared to that of pre-menopausal women. (Bhuvaneswari and Meenakshi, 1999).

Analysis is to examine modifiable Cardio Vascular Disease risk factors in relation to menopausal status, age, and length of residence in the U.S. of mid life women from the former Soviet Union. The analysis include baseline data for 193 women, aged 40-70, who lived in the U.S. fewer than 8 years and were enrolled in an ongoing four-year study of post-immigration health and behaviour change. The presence of seven health risk indicators (obesity, dyslipidema, high blood pressure,
diabetes mellitus, sedentary life style, smoking and excessive alcohol use) was assessed. In addition, Framingham ten year risk scores for heart disease, and the presence of metabolic syndrome, were calculated using recent National Cholesterol Education Program guidelines. Consistent with the age distribution, 60% of the women were postmenopausal. Four risk indicators (obesity, dyslipidemia, high blood pressure, and sedentary life style) were identified as significant areas of concern. (Miller et al 2003).

Chandha (2001) also reported that majority of women, around the age of 65 years of age die of cardiovascular disease.

Deaths due to heart attack have been increasing in India from 8% in 1960 to 19% in 1980 and recent estimates indicate a further increase to 25%. The disease has equally affected India. Every year 27 lakhs people die of heart attack. After menopause women are equally affected as men. These account for a quarter of total number of death every year (Chadha and Katyal, 1995)

In a study to assess the nutritional status and lipid profile of postmenopausal women with coronary heart disease. It was found that the nutritional status was inadequate due to the prevalence of obesity, which results in the appearance of other chronic diseases, such as dyslipidemias, high levels of total cholesterol and Low Density Lipoprotein- Cholesterol were observed, and those high levels in that condition are strongly related to the occurrence of cardiovascular diseases. (Oliveira and Filho, 2005)

Anaemia

Nutritional adequacy is one of the key determinants of the quality of human resources everywhere. The problem of malnutrition in developing countries encompasses a spectrum of deficiencies of which the most devastating is a deficiency of three micronutrients iron, vitamin A and iodine. About 30% of the world's
population is anaemic and about half of those cases are due to iron deficiency. (Seshadri, 1996).

A study that assessed anaemia in over 8000 subjects in rural communities, in Malaysia, identified a high prevalence of anaemia in children aged 7-12 years of both sexes (22 percent) female subjects aged from 18 to under 60 years (25 percent) and the elderly of both sexes (23 percent) (Khor, 2002).

ACC/SCN (2000) has reported that Asia has the highest rates of anaemia in the world. About half of the world’s anaemic women live in the Indian sub continent and 88 percent of them develop anaemia during pregnancy.

The nutritional status of women especially that of the rural poor is far from what is desired. Inspite of the prophylactic programmes against nutritional anaemia targeted at the expectant and lactating mothers, these women continue to suffer from acute anaemia. The low nutritional status of women in India applies to all age groups but is more acute in the cases of young girls, pregnant and aged women. While in the lowest socio-economic groups, the low nutritional status of women is mainly due to poverty and the burden of family responsibilities, in the lower middle income groups, it is aggravated by general neglect and is the indirect result of stronger gender discrimination. (Goel, 2004).

More than 320 Million people in India suffer from iron deficiency anaemia with highest prevalence among women and children. (Yegammai et al 2004)

Iron deficiency anaemia is more common in women than in men. About 55% of pregnant women and 44% of all women suffer from anaemia in developing countries. At ages between 15-44 years, the burden of iron deficiency anaemia in developing countries in 1990 in terms of thousands of DALYs per year was 4898 for men 7135 for women. (WHO 1998).
Anitha. C (2005) in her study on nutritional profile of middle aged women of BPL families has found that 66% of the subjects were having Hb levels below 12g/dl which is an indication of anaemia.

A study conducted in Andhra Pradesh on prevalence of anaemia a total of 4032 women aged 15-49 from 3872 households were examined. In all 32.4% of women had mild anaemia, 14.19% had moderate and 2.2% had severe anemia. Fifty two percent of thin, 50% of normal BMI and 41% of overweight women were anaemic. (Bentley and Griffiths 2003).

**Obesity**

Obesity can be defined as a disease in which excess body fat has accumulated such that health may be adversely affected (Kopelman, 2000). The Body Mass Index (BMI) refers to the overall fatness where as Waist to Hip Ratio (WHR) and Conicity Index (CI) refers to abdominal adiposity. Kawada (2002) reported that BMI of women has an influence on blood pressure and lipid profile and is a good predictor of hypertension and hyperlipidemia.

The cut-off values for normal waist circumference were 85 and 80 cm and for WHR 0.89 and 0.81 in men and women respectively. Use of waist circumference as an index of upper body adiposity appeared to be more sensitive than Waist to Hip Ratio as the former showed an interaction with general adiposity at lower levels of Body Mass Index. Therefore, in women use of waist circumference as an index of central adiposity is recommended. (Snehalatha et al 2003).

Data from WHO’s Global Data base on obesity and Body Mass Index in adults covering 84 countries around the world in 1999-2000, showed that the global prevalence of obesity (BMI > 30 kg/m2) was 8.7 percent. (Florentio, 2002).
Low weight, independent of menopausal status, leads to the typical gynoid pattern of fat distribution while excess weight and obesity result in the android pattern of distribution in pre- and postmenopausal women. (Kirchengast et al 2005)

Obesity is recognized as an independent risk factor for hypertension, lipid abnormalities and diabetes mellitus, which are known to be independent risk factors for Cardio Vascular Disease. Cardio Vascular Disease is the leading cause of death in women who have past the age of menopause (Upkar et al 2000).

The excess of fat in men tends to accumulate in the upper abdomen. In women, the favoured sites for the accumulation of fat are the buttocks, hips and thighs (Bose et al 2005)

High Body Mass Index was more strongly related to adverse cardiovascular biomarker levels than physical inactivity. However, within Body Mass Index categories, physical activity was associated with more favorable cardio vascular biomarker levels than inactivity. (Mora et al 2006).

Changes in the nutritional state of postmenopausal women indicated height decreased with age. Bigger skin fold thickness and larger waist and hip circumferences were observed among women at postmenopausal age compared to women aged 50 years. Changes in mean body mass and Body Mass Index (BMI) were found in the early postmenopausal stage between 50 and 60. Obesity was two times more prevalent among women aged 69-71 years than among women aged 50 years. Density of forearm bones decreased with age. (Chabros et al 2003)

Life style of transition occurring in the women had significant influence on the prevalence of obesity and glucose intolerance. Prevalence of diabetes had increased from 2.2 to 6.3 per cent in a period of 14 yr. Important risk factors
associated with this increase were lack of physical activity and increased upper body adiposity. (Ramachandran, 2004).

Obesity is linked with increased incidence of dyslipidemia, hypertension and type II diabetes, all of which are major contributors to mortality in women. Women who are obese are at greater risk for hypertension, gall bladder disease, respiratory disease, gout, sleep apnea, osteoarthritis and several forms of cancer. (Pettigraw and Fairley 1997)

Obesity shortened life of 40-50 year old men and women by 5.9 and 6.4 years respectively and shortened the life of 70-79 years old men and women by 3.5 and 1.7 years respectively (St-Onge and Heymsfield 2003). For a given Body Mass Index Asian Indian women have higher fat percentage compared with caucasian subjects. (Banerji et al 1999).

Total body fat and abdominal fat accumulation seems to results in more serious hyperinsulinemia and insulin resistance in central obesity. Body Mass Index and waist Hip Ratio in obese postmenopausal women may reveal their risk in coronary Heart Disease (Cikim et al 2005).

In a survey of 648 women, in the age of 45 and above cardiovascular risk factors were compared and it was found that they had a significantly higher body mass index, waist circumference and waist-to-hip ratio. (Roberts et al 2003)

Sensitivity of waist circumference is an index of disease risk in postmenopausal women (Pelt et al 2001). The body fat distribution changes according to menopausal status, with central obesity more pronounced in postmenopausal women (Garauet, 2001).
The prevalence of obesity is increasing globally, especially among women with nearly half a billion of the World’s population now considered to be overweight or obese (Rossner, 2002).

**Hypertension**

High blood pressure is a significant public health problem world wide which is associated with increased risk of cardiovascular disease, stroke and renal disease. The development of this disease influenced by genetic and environmental factors. (Groziak et al 2000)

Hypertension consitutes one of the major risk factors and accounts for more than 5 percent of total deaths world wide. (Pardell et al 2000). The prevalence of hypertension in India ranged between 16.89 per cent to 23.7 per cent in rural areas and between 30 per cent to 33 per cent in urban areas (Chhabra et al 2000)

Samnata (2003) opines that high prevalence of diabetes mellitus was observed in female hypertensives than male hypertensives. Female hypertensives with Body Mass Index less than 25kg/m\(^2\) had higher prevalence of diabetes mellitus than male hypertensives with Body Mass Index less than 25kg/m\(^2\).

Weight reduction is most important to lower blood pressure in majority of hypertensive women. For every 900g weight gain, 1mm of systolic blood pressure rises. Generally, for every one kg weight loss there is a fall of approximately 3mm Hg systolic and 2mm Hg of diastolic blood pressure (Anand, 1999).

Several prospective studies have shown that both in postmenopausal women overall and abdominal obesity are related to cardiovascular disease, weight gain increases the risk of developing hypertension independent of age and blood pressure (Lee, 2004).
A study conducted by Begum, et al (1994) on the prevalence of hypertension in the Urban populations in India reveal that in comparison with North Indians, the prevalence of hypertension was higher in south Indians. While prevalence of diabetes mellitus, glucose tolerance central obesity, hypercholestrolemia, were comparable between north and South Indian in both men and women.

**Diabetes Mellitus**

Diabetes Mellitus is one of the most burdensome chronic diseases that is increasing in epidemic proportion throughout the world. Death attributed to diet related non-communicable diseases in India is projected to increase from 31.6 to 43.3 percent of all deaths by 2020. (Popkin et al 2001)

Diabetes is another disease seen in postmenopausal women. Blood sugar is important in postmenopausal women because of its relationship to type 2 diabetes. Type 2 diabetes is a common disease that interferes with the body's ability to use and store energy from food and leads to high blood sugar level. Overtime high blood sugar levels can lead to blindness, kidney failure, nerve damage and possibly heart disease (Penckofer et al 1997).

Non diabetic postmenopausal women can reduce insulin concentrations and improve insulin sensitivity by consuming alcohol in moderation. (Davies, 2002)

Most women are diagnosed with type II diabetes over the age of forty. Postmenopausal women are diagnosed with type II diabetes because Lower levels of the hormones estrogen and progesterone, and human growth hormone contribute to lower metabolism and obesity which is the major cause of type II diabetes. Menopause can also cause many other problems for women with type II diabetes. Post menopausal women should be routinely screened for diabetes to allow facilitate early detection and treatment. (Revis and Keene, 2007)
Dietary supplementation with soy phytoestrogens favorably alters insulin resistance, glycemic control, and serum lipoproteins in postmenopausal women with type 2 diabetes, thereby improving their cardiovascular risk profile. (Jayagopal et al 2002)

A high vitamin C intake from supplements is associated with an increased risk of cardiovascular disease mortality in postmenopausal women with diabetes. (Lee et al 2004).

Mukamal et al (2001) observed that diabetes was associated with markedly increased mortality after acute myocardial infarction, particularly in aged women.

Whole bone density falls with age in all human races and in women the process starts or at least greatly accelerates at the menopause. Young women have lower bone density than young men, because of menopausal effect and because women live longer than men, the social and medical complication of osteoporosis are far more significant in women after menopause (Tripathi et al 2001). Hence review related to osteoporosis in Postmenopausal women is presented in 2.5.
2.4 DIETARY HABITS

According to Bamji (1996) Diet is a vital determinant of health and nutritional status of people. The dietary habits of individuals vary according to socio economic factors, regional customs and traditions.

Gupta et al (1995) opines that in India the dietary intake is related to socio-economic status, the higher income groups consume 45 percent of the available fat. National surveys indicate that per capita income, better housing, ownership of land; occupational status and education were positively associated with higher intake of dietary fat. (Gupta et al 1995).

Diet deficient in micronutrients are characterized by high intake of staple food crops (Such as rice, wheat etc) but low consumption of foods rich in bioavailable micronutrients such as fruits, vegetables animal and fish products (www.harvestplus.org).

Survey of NNMB (2002) indicates that the intake of micronutrients in daily diet is far from satisfactory and largely less than 50 per cent RDA is consumed by over 70 percent of Indian population. The loss due to micronutrient deficiency costs India 1 per cent of its GDP. This amounts to a loss of Rs. 27,720 crore per annum in terms of productivity, illness, increased health care costs and death.

NSSO (2000) reports that all adult women in India consume cereals every day; their diets tend to be monotonous and there is very little dietary diversity. Fruits are eaten daily by only 8 percent of women and only one-third of women eat fruits at least once a week. Almost one-third of women in India never eat chicken, meat or fish and very few women (only 6 percent) eat chicken, meat or fish every day. Eggs are consumed less often than chicken, meat or fish.
In a study conducted by Behali et al (2004) revealed that among postmenopausal women, total cholesterol was significantly lower when the diet contained 3 or 6g - glucan per day from barely than when it contained no - glucan. He also reports that addition of barely to a healthy diet may be effective in lowering the total and Low Density Lipoprotein cholesterol in both men and women.

Lin etal (2001) reports age of attaining peak bone mass and the impact of dietary factors, especially calcium and magnesium in women has an interaction of calcium and energy intake associated with changes in body weight, such that only at lower energy intakes, calcium intake was related to change in body weight.

Eun Jeong (1999) studied on the effect of menopause on selenium status, serum estrogen, and selenium parameters in postmenopausal women. It was revealed GPx (Glutathione Peroxidase) activity in postmenopausal women was elevated compared to that of pre-menopausal women with similar levels of estrogen and dietary selenium intakes, suggesting that age-related changes in oxidative stress might increase GPx activity.

Tanja and Eva (2004) reports in women the combination of large portion sizes of foods with a high energy density may facilitate the over consumption of energy.

In the developed countries like North America and Europe 30 - 40% or more of the dietary energy is derived from fat and only 30-40% from carbohydrate (ie cereal grains and sugar) on the other hand in the developing countries like India 60-80 % energy is obtained from cereal grains while only 5-20% of energy is derived from fat. Protein contributes to 10-15% energy in the dietaries of most countries. (Krishnaswamy, 2000).

In study on post menopausal women in Australia it was found that halving salt intake from 5 g to 10 g had the same effect on hip bone density as a 1000 mg increase in calcium intake. younger healthy women may partly adapt to salt induced
excretion of calcium by absorbing higher amounts of the mineral from food. (Dowden, 2004).

According to the findings of NSSO (2000) Women in urban areas are more likely than women in rural areas to include every type of food in their diet, particularly fruits and milk or curd. Illiterate women have less varied diets than literate women. Poverty has a strong negative effect on dietary diversity. Women in households belonging to low socio-economic group are less likely than other women to eat items from each type of food group listed and their diet is particularly deficient in fruits and milk or curd. There are substantial inter state differences in consumption of different types of food.

According to Genaro and Martini (2004) Vitamin A intake has only a limited interpretability in well nourished populations A variety of clinical conditions can alter serum retinol levels. Serum retinol increases with age and tends to be higher among women users of oral contraceptives and estrogens.

A study by Nemati and Baghi (2008) on postmenopausal women revealed the general proportions of overweight for rural and urban women were 37.9 and 44.6%, respectively. The mean of daily iron and vitamins (B₁, B₃ and C) intakes of post menopausal women were adequate. However the mean of folate, vitamins B₂ and B₆, calcium, zinc, selenium and calorie intake were less than dietary reference intakes. The percentage of overweight, obesity among post menopausal women in urban area were more than rural area.

Hu et al., (2003) opines that higher consumption of fish and long-chain omega 3 fatty acids was associated with a lower Coronary Heart Disease incidence and total mortality among middle aged diabetic women.

According to Agarwal (1988) The diets of women are mainly cereal based, it was found that women consumed only 1500-1600 kilo calories and 30-40 grams of
proteins per day, during the non pregnant state and even during pregnancy, these intakes did not increase.

Fruits and vegetables could enhance satiety though their high water content and low energy density. Adding fruits and vegetables to the diet can reduce overall energy density and allow consumption of satisfying portions while reducing calories. This strategy could play an important role in weight management especially for postmenopausal women. Consuming an additional 14 g/day of fiber for more than 2 days was associated with a 10% decrease in energy intake and a loss of 1.9 kg over 3.8 months. Thus the increase in fiber intake associated with increased consumption of fruits and vegetables could help reduce energy intake and body weight in elderly women. (Rolls et al 2004)

Lenfant (2001) opines that diets high in fruits and vegetables and low-fat dairy products are extremely effective in lowering blood pressure, in short-term in postmenopausal women.

Schroder et al., (2004) found out that adherence to the traditional Mediterranean dietary pattern, characterized by high intake of vegetables, fruits, legumes, fish cereals and nuts and low and moderate consumption of meat and wine, respectively is associated with a low prevalence of obesity in older men and women in the Mediterranean population.

According to Kaushik (2000) a woman's energy output is less than a man's and she normally requires less food. In the case of the protective foods particularly the iron containing foods, her needs are, however, almost certainly greater than those of a man. Many women make the mistake of ensuring an adequate diet for their husbands and children at the sacrifice of their own.

The oil in flaxseed is unique in that it is composed of 73% polyunsaturated fatty acids (PUFA), 18% monounsaturated fatty acid (MUFA) and 9% saturated fatty
acids, making it a low saturated fat food. Flax may protect against cardiovascular disease through a number of mechanisms, including reducing serum cholesterol, platelet aggregation and inflammatory markers improving glucose tolerance, and acting as an antioxidant after menopause. (Bloedon and Szapary 2004).

In the diet of postmenopausal women modification by flaxseed is associated with an increase in urinary lignan excretion. Despite the shift in estrogen metabolism to favor the less biologically active estrogens, a negative effect on bone cell metabolism was not observed. (Brooks et al 2004)

A study by Schoppen et al., (2004) among postmenopausal women showed that consumption of carbonated sodium- rich water can play a beneficial role in preventing cardiovascular diseases.

Stark and Madar (2002) reports Olive oil is considered one of the dietary constituents that contributed to be the cardioprotective effect after menopause.

Consumption of foods containing 110 mg/d of soy isoflavone aglycone equivalents for 1 y did not prevent postmenopausal bone loss and did not affect bone turnover in apparently healthy early postmenopausal white women. (Brink, 2008).

Neelam et al.,(2004) opines that supplementation of 45 grams of soy flour in the daily diet of postmenopausal women for a period of 4 weeks significantly decreased the post menopausal symptoms like vaginal dryness (20 percent) frequent urination (45 percent) pain in joints (10 percent) and sleep disturbances (10 percent).

Vazifdar (2004) opines that menoceso a herbo mineral menopausal formula is effective and well tolerated for relieving menopausal symptoms including hot flashes and sleep disturbances.

In a survey of NFHS (1999) it was found most foods are consumed by similar proportions of urban and rural women, however, women in urban areas are somewhat more
likely than women in rural areas to include milk and curd, pulses or beans, fruits, and eggs in their diet, whereas women in rural areas are more likely than women in urban areas to include chicken, meat, or fish and green leafy vegetables in their diet. Illiterate women have poorer and less varied diets than literate women, and their diet is particularly deficient in such nutritious foods as eggs, milk or curd, and fruits. Women in households with a low standard of living are much less likely than other women to eat all types of food on a regular basis. (NFHS 1999).

Gissi (1999) reports the quantity and quality of dietary fat alter the serum lipid fractions which in turn play an important role in the development of cardiovascular disease. In Kerala, most of the foods are prepared using coconut oil and coconut kernel. The rate of fish consumption in Kerala is also high. Epidemiologic and clinical studies indicate that consumption of fish and fish oil is associated with a lower rate of heart disease mortality. Torres et al (2000) also states Consumption of 50-100g of sardine flesh daily will provide 0.5-1g of docosa hexaenoic acid per day.

Women should approach middle age with a good nutritional status and in good physical condition. A variety of foods should be consumed to meet nutritional requirements, and if the diet is restricted, supplements should be added. (Moghissi and Evans 2003).

According to Tranquilli (1994) nutritional factors are relevant to bone health in postmenopausal women, and dietary supplementation may be indicated for the prophylaxis of osteoporosis. Adequate nutritional recommendations and supplements should be given before the menopause, and dietary evaluation should be mandatory in treating postmenopausal osteoporosis.
2.5 OSTEOPOROSIS IN POSTMENOPAUSAL WOMEN

The WHO has defined osteoporosis as a condition characterised by low bone mass and micro-architectural deterioration of bone tissue which leads to enhanced bone fragility and a was frequent increase in fracture risk. These fractures are most common in the wrist, spinal vertebrae and hip but they can occur else where in the skeleton. Osteoporosis is further defined by the WHO as a BMC or BMD, measured by absorptiometry, of more than 2.5 standard deviation below the young adult mean. Fractures are the clinically important manifestation of osteoporosis (Gibney et al 2003). A WHO Study Group has defined osteoporosis as “a disease characterized by low bone mass and micro architectural deterioration of bone tissue leading to enhanced bone fragility and a consequent increase in fracture risk”. (Chan et al 2003)

Osteoporosis is a disease characterized by decreased Bone Mineral Density (BMD), microarchitectural deterioration, and fragility fractures. (Lane, 2000). The association of osteoporosis and related fractures with increased morbidity, mortality, and healthcare costs makes this disease a major public health concern globally. (Faulkner, 2007)

Osteoporosis one of the most prevalent diseases of aging affecting more than 25 million people in united states most of them women, contributing to 1 million breaks in the bones of the hips, wrists arms and ankles each year. Around 65 million Indians suffer from ostecoporosis and about 23 lakhs are added to this figure each year in India. Asian women are more prone to this disease and 30 percent of the menopausal women suffer from this disorder (Ahuja, 2002).

Osteoporosis is a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue with a consequent increase in
bone fragility and fractures after minimal trauma. An expert panel convened by the World Health Organisation (WHO) developed a definition of osteoporosis based on bone densitometry: osteoporosis is a BMD at one of the three sites of > 2.5 5D below the young normal mean. (Ness and Kuller, 1999)

Osteoporosis is a major health problem world-wide; in the U.K. alone, more than 3 million people have osteoporosis with one in three women and one in 12 men aged greater than 50 years experiencing a fragility fracture (Ginty and Prentice, 2004).

Osteoporosis is caused by a loss in both the protein matrix and the mineral deposits of bone, resulting in a decrease in the total amount of bone. As bone mass decreases, the likelihood of fractures increases. Risk is greater in women than men because men have a higher peak bone mass and because women have an acceleration of bone loss for about 5 years after menopause. Having more body fat decreases the risk of osteoporosis because adipose produces estrogen, which helps maintain bone mass and enhances calcium absorption. (Smolin and Grosvenor, 2000)

Osteoporosis-related bone fractures are a significant cause of mortality and morbidity, with women being particularly affected. Osteoporosis is a condition of bone fragility resulting from micro-architectural deterioration and decreased bone mass; adult bone mass depends upon the peak attained and the rate of subsequent loss; each depends on the interaction of genetic, hormonal, environmental and nutritional factors. (Bunker, 1994)

Osteoporosis that distinguishes two types: type I (postmenopausal) osteoporosis and type II (age-related) osteoporosis. Type I osteoporosis primarily affects postmenopausal woman aged 51-75 at 6 times the rate of men, and it associated with accelerated rates of bone loss due to estrogen deficiency. There is a
disproportionate loss of trabecular bone. It is characterized by fractures in sites that are predominately trabecular, such as distal forearm fractures and vertebral crush fractures. Type II osteoporosis primarily affects individuals after 70, with a female-to-male ratio of 2:1. It is characterized by a slow rate of bone loss that begins around age 40 in both men and women. Both cortical and trabecular bone loss occurs, resulting in hip and vertebral (multiple wedge) fractures. (Ness and Kuller, 1999).

Though prevalent in white postmenopausal women, osteoporosis occurs in all populations and at all ages and has significant physical, psychosocial, and financial consequences. Risks for osteoporosis (reflected by low bone mineral density [BMD] and for fracture overlap but are not identical. (NIH, 2001)

During the first three decades in a human’s life, the rate at which osteoblasts are forming new bone exceeds the rate of bone resorption by osteoclasts, resulting in bone acquisition. After the age of above 30 years, bone resorption exceeds bone formation, resulting in progressive bone loss. Therefore, maximizing during the bone acquisition stage protects against the future risk of osteoporosis. (Saggese, 2001)

After age 40, women experience an age related phase of slow bone loss. The rapid loss of bone mass for women occurs during the first 4 to 8 years after menopause. Osteoporosis is a debilitating disease that affects over 24 million Americans. Each year in the U.S. 1.3 million fractures are attributable to osteoporosis. The most common fractures occur at the wrist, the spine and the hip. Because of the lack of a cure for osteoporosis. Approximately 80 percent of the bone mass is genetically determined. The other 20 percent can be modified by lifestyle factors. (Espy, 2000)

Fracture incidence rates rises steeply amongst women older than 35yrs, with approximately 70 percent of fractures in people aged more than 45 being due to osteoporosis. Postmenopausal osteoporosis is a very common problem leading to
increased risk of fractures. Postmenopausal osteoporosis is characterised by low bone mass, structural damage to bone tissues and increased probability of spontaneous fractures. The mechanism leading to net bone loss are osteoclastic overactivity or osteoblastic underactivity. (Prabhakaran, 2003)

For adults at risk for osteoporosis low body weight is considered a significant risk factor. Studies show that a higher body weight is usually the best predictor of Bone Mineral Density (BMD) in either young adults and older men and women. In some studies the BMD effect is related to fat mass only where as in others the BMD effect is related to fat and lean mass. Thus body weight has been identified as a positive predictor of BMD. Indeed weight loss promotes bone loss so the advantage of weight loss for health must be considered in light of increased bone loss associated with weight reduction in adult man and women (Whiting, 2002)

As per the study of the Indian society of Bone Mineral Research 20 percent of Indian women over 40 suffer from osteoporosis or brittle bones while 65-70 percent suffer from osteopenia or weak bones. (Sanyal, 2003).

Women are at greater risk than men by a ratio of 4 : 1 women have less bone mass experience accelerated loss of bone mass following menopause and ingest less calcium than do men. A life long habit of drinking milk is associated with increased bone mass. Calcium is well absorbed from vegetables such as broccoli, bokchoy, kale and tofu and dairy products like milk yogurt cheese processed cheese. Spinach is a concentrated source of calcium, but this calcium is poorly absorbed because it is complexed with oxalic acid and it is therefore indigestible. (Espy, 2000).

Chronic dieting to maintain a high body weight, low calcium intake, cigarette use or alcohol abuse and limited physical activity, both past and present are known to decrease Bone Mineral Density. (Rollins et al. 2003).
After menopause (after 49 yrs of age) BMD drops precipitously in women where as loss in men in minimal until almost 70 yrs (Diaz et al 1997).

Calcium supplements have been found to be helpful in reducing bone loss in postmenopausal women, but are not effective at increasing bone mass. The effect of calcium supplements in decreasing calcium losses in postmenopausal women in greatest after the first five years of menopause and has more of an effect on cortical than on trabecular bone loss. (Smolin and Grosvenor, 2000)

Foods that are rich in vitamin C enhance calcium availability, probably due to the redox nature of ascorbic acid. This vitamin readily changes from an oxidized to a reduced form and assists not only calcium absorption but also assists in the absorption of iron. (Berdanier, 1998).

Calcium and vitamin D in combination is the accepted base-line treatment for osteoporosis and also is used as a preventive measure, particularly for frail elderly patients. After 3 years of treatment with calcium (1200 mg) and vitamin D (20 g (800 IU), the incidence of new hip and non vertebral fractures in elderly women was lower than in patients who did not receive such treatment and a significant benefit was seen after 18 Months. (Larslidgren, 2003).

The risk of hip fracture was almost doubled among women with retinol intakes of approximately 2000 g/day or more compared with those with intakes of less than approximately 500 g/day (Genaro and Martini, 2004).

Positive health benefits of such exercises for Chinese postmenopausal women with a substantial decrease in BMD loss in the distal radius and tibial regions. Even though current data on the role physical activity in preventing osteoporosis are inconclusive, it is generally agreed that regular practise of some forms of high-impact and weight bearing exercise could improve muscle strength and aid in the prevention and treatment of osteoporosis. (Chan et al 2003)
Vegetarians lose less bone than omnivores. This is attributed to the lower percentage of sulfur-containing amino acids, when present in amounts more than required for body’s needs, are metabolized to sulfate and are excreted in the urine making it more acidic. A vegetarian diet also increases the recycling of steroids such as estrogens which are secreted in the bile and are reabsorbed through the intestinal mucosa. (Sardesi, 1998)

The relationship between vitamin B12 blood levels and indicator of bone health measured in 2,576 men and women aged 30 to 87 participating in the osteoporosis study, revealed that people with vitamin B12 levels lower than 148 picomoles per liter (PM/l) were at greater risk of osteoporosis than those with higher levels. The results showed that those with vitamin B12 concentration below 148PM/l had significantly lower average BMD, at the men’s hip and at the spine in women than those with concentrations above. Osteoporosis usually progressed with outward effect until a fracture occurred. Low stomach acid and aging was thought to lower the ability to absorb the vitamin. Therefore people aged above 50 are encouraged to consume fortified foods or supplements containing B12 and adequate vitamin B12 intake for maintaining BMD is important. (www.ars.usda.gov.)

Among other things, magnesium has a role it regulates active calcium transport. As a result, there has been a growing interest in the role of magnesium (Mg) in bone metabolism. A group of menopausal women were given magnesium hydroxide to assess the effects of magnesium on bone density. At the end of the 2-year study, magnesium therapy appears to have prevented fractures and resulted in a significant increase in bone density (Sojk, 1995)

Chronically high intakes of protein, sodium chloride, alcohol and caffeine may also adversely affect bone health. The typical western diet (high in protein, salt and refined, processed foods) combined with an increasing sedentary lifestyle may
contribute to the increasing incidence of osteoporosis especially in elderly women. (Bunker, 1994)

Soy isoflavones and other phytoestrogens are gaining popularity as alternative menopausal therapies due to their actions at estrogen receptors. Nine randomized controlled trails examining soy isoflavone intake and bone metabolism and performed a meta-analysis on the outcomes of these studies. Isoflavone intake was associated with a significant increase in BAP, indicating a positive effect of isoflavones on bone formation. (Ma et al 2008)

Adequate calcium and vitamin D intake is crucial to develop optimal peak bone mass and to preserve bone mass throughout life. Supplementation with these two nutrients may be necessary in persons not achieving recommended dietary intake. Regular exercise, especially resistance and high-impact activities, contributes to development of high peak bone mass and may reduce risk of falls in older persons. (NIH, 2001)

Adequate calcium intake, weight bearing exercise and estrogen replacement therapy for women who have entered menopause are the primary lifestyle factors associated with reducing the risk of osteoporosis. Factors associated with increased risk of osteoporosis include smoking and abuse of alcohol and caffeine. (Espy, 2000)

In a study by Hodgson (2008) Randomly selected women aged 70-85 y (n=1460) were recruited from the general population to a randomized controlled trial of calcium supplementation and fracture risk. Daily (≥1 times/d) consumption of chocolate, in comparison to < 1 time /wk, was associated with a 3.1% lower whole-body bone density; with similarly lower bone density of the total hip, femoral neck, tibia, and heel; and with lower bone strength in the tibia and the heal (P<0.05, for all).
Many studies have shown that better education is favorable for lowering the risks for a number of chronic diseases, but little information is available on the relation with bone health. Ho et al (2005) examined the association of educational level, classified as levels I–IV, with bone mineral density (BMD) and with the prevalence of osteoporosis among 685 population-based, postmenopausal, Chinese women aged 48–63 years during 1999–2001. They observed a significant dose-response positive relation between educational level and BMDs.

In the first few years following menopause, women experience rapid bone loss that then becomes more gradual and sustained throughout the remainder of life if untreated. This loss of bone mass accompanies the decline of available estrogen in menopause, and long-term hormone-replacement remains an important preventive therapy for osteoporosis. (Ma et al 2008)

According to Papalia et al (2002) the benefits and risk of estrogen includes the following:

Estrogen : Benefits and risks (Papalia et al 2002)

**Estrogen Benefits**
- Relief from the classic symptoms of menopause hot flushes, mood swings vaginal dryness, thinning skin.
- Proven reduced bone loss (osteoporosis) associated with menopause including a probable reduction in hip fracture
- Possible reduced risk of heart disease by improving cholesterol levels and the flexibility of blood vessels.
- Possible lowered risk of colon cancer.

**Estrogen risks**
- An increased risk of endometrial cancer which may be countered by adding Progestrone to a regimen of estrogen.
- Symptoms similar to premenstrual ones (swelling bloating breast tenderness, mood swings, headaches)
- A menstrual discharge ( when progesterone is taken with estrogen)
- Probable increased risk of breast cancer
- stimulation of the growth of uterine fibroids and endometriosis
- probable increased risk of gall stones and blood clots.
- Possible weight gain.