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Osteoporosis In Palestinian Women: Evaluation Of Risk Factors

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Osteoporosis In Palestinian Women: Evaluation Of Risk Factors

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2003

Declaration

I Certify that this thesis submitted for the degree of master is the result of my own research, except where otherwise acknowledge, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Dedicated....
To my beloved family,
To my beloved friends,
To my beloved A.V.H. with all Faculty.
To my university.
To all Palestinian Women.

Signed: Iman Ahmad Al-Shaweesh.

Date: 4/6/2003.

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ABSRTACT

Osteoporosis is an insidious disease. It is asymptomatic disease till the subject gets bone fracture such as hip fracture, vertebral (lumber spine) fracture and med-raduis fracture with minor trauma. It is a worldwide health problem, for women in particular, and its risk factors, protective factors and early diagnosis have been well documented in many populations worldwide. However the Palestinian population in general and the high risk group Palestinian women has not been studied. The confirming diagnosis to this disease is a retrospective one based on the occurrence of the fractures mentioned above in the patient with no or little trauma. Our study will be the first detailed study of osteoporosis in Palestinian women based on 338-subject of Palestinian women at various ages. The sample contains osteoporotic, osteopenia and normal subjects. We will compare osteoporotic women to their age matched normal controls. In this study we want to address the question does osteoporosis in Palestinian women follow the same worldwide pattern with regard to prevalence, risk factors and protective factors as the worldwide one or not? After analysis and based on WHO definition of osteoporosis we found that 81 women have osteoporosis, 137 women have osteopenia and 130 women are normal. Furthermore comparing the osteoporotic and normal groups together using SPSS chi-square test analysis we confirm that the following universal factors affect the progress of osteoporosis in Palestinian women. These significant factors in our study include aging, menopause, life style (low consumption of milk or its product, poor sport activities and high caffeine intake), loss of weight, body weight, early menopause, risky disease as rheumatic disease, and steroid therapy. Based on these result prevention must be focused on risky groups, and on bone densitometry DXA for early prevention of this silent disease.

TABLE OF CONTENT

ABREVIATION

BC	Before Christ.
BMD	Bone Mineral Density.
BMC	Body Mineral Content.
BMI	Body Mass Index.
CM	Centimeter.
DXA	Duel-Energy X-Ray.
HRT	Hormonal Replacement Therapy.
HT	Height
IOF	International Osteoporosis Foundation.
IM	Intramuscularly.
N/S	Nasal Spray.
NORA	National Osteoporosis Risk Assessment.
NOF	National Osteoporosis Foundation.
POPS	Palestinian Osteoporosis Prevention Society.
QC	Quality Control.
QUS	Quantitative Ultrasound.
QCT	Quantitative Computed Topography.
SD	Standard Deviation.
S/C	Subcutaneous.
WHO	World Health Organization.

List Of Figures

Figures **Page**

List Of Tables

Tables **Pages**

Tables **Pages**

DEFFINITIONS

Body Mass Index (BMI): anthropometrical measure of body mass. Weight in kilograms divided by height in meter square. (m^2).

Coefficient of Variation: Is the standard deviation expressed as a percentage of the mean.

Cortical Bone: Compact dense bone that makes up eighty percent of skeletal mass.

DXA: Dual energy X-ray absorptiometry. Bone density systems that use two X-ray energies to measure bone density, with a low patient exposure and a fast scan time.

Estrogen: A steroid hormone produced primarily by the ovaries but also by the adrenal cortex. It is responsible for the development of secondary sex characteristics and the cyclic nature of reproductive physiology.

Gravida: Is the number of pregnancies by one female.

Hormonal Replacement Therapy: Therapy of estrogen alone (ERT) or a combination of estrogen and progesterone (HRT) used to treat changes associated with menopause, such as hot flushes.

Morbidity: A measure of disease to a defined population.

Menopause: It is a term derived from two Greek words (Meno) meaning month and (pause) meaning terminate. Cessation of the menses by women at age of >45, called change of life.

Osteopenia: Condition in which bone mass is low, bone mineral density 1-2.5 SDs below the mean value of peak bone mass in young adult women. (WHO, 1994)

Osteoporosis: Bone mineral density more than 2.5 SDs below the mean value of peak bone mass in young adult women.

Osteomalacia: Is a reduction in mineralization of the bones.

Progesterone: Is the hormone produced by the corpus luteum whose function is to prepare the endometrium for the reception and development of fertilized ovum.

Prevalence: a measure of morbidity based on current sickness/disease in a population.

Premenopause: Women having regular periods without experiencing changes in menstrual flow.

Postmenopause: Women having no periods for at least one year and only attributed to menopause.

Precision: Ability of an instrument to reproduce the same results in repeat measurements.

Perimenopause: Changes or irregularities in menstrual flow not attributed to other causes, during the last 12 months.?

Premature menopause: Early menopause before the age of 40 years. Also known as primary ovarian failure.

Primary health cares: First contact and continuing comprehensive health care, including basic or initial diagnosis and treatment, health supervision, management of chronic conditions and preventive health services.

Para: The term used to refer to past pregnancies that have produced an infant that has been viable whether the infant is alive at birth or not.

Parity: The condition of a woman with respect to her born children.

Programming: Term used to describe persisting changes in structure and function caused by environmental stimuli during critical period of early development.

Severe Osteoporosis: Bone mineral density more than 2.5 SDs below the mean value of peak bone mass in young adult women, and the presence of fractures.

T-Score: Indicates the amount of bone loss, by quantifying the difference between the patients Bone Mineral Density (BMD) at his/ her current age, and the peak bone mass achieved by young normal individuals.

Trabicular bone: Spongy bone, comprising twenty percent of the skeletal mass and very metabolically active.

World Health Organization (WHO): An international organization that deals with health issues, sets policies, and publishes reports.

OSTEOPOROSIS IN PALESTINIAN WOMEN EVALUATION RISK FACTORS

I- INTRODUCTION:

I-1 Historical Background:

Involution bone loss was recognized 150 years ago by sir Astely Cooper who observed its association with hip fracture. The term 'osteoporosis' however, was first used in medical circles in the 19th century by the German and the French physicians when describing the histological appearance of osteoporotic bone. (Cooper &Jordan, 2002). Osteoporosis was first documented in 3000 BC, the term has been used in the past loosely to include all states in which there is a reduction in the amount of calcified bone, regardless of whether or not it is association with fractures. In addition some clinicians incorrectly use the term osteoporosis synonymously with postmenopausal reduction in bone mass. It is important to clearly differentiated osteomalacia in which there is a reduction in mineralization of bone and osteoporosis. (Cummings et al, 1985).

I-2 Definition and Description:

"Osteo" means bone ,and "porosis" means thinning or becoming more porous, so osteoporosis literally means "thinning of bone".(Arthritis Society,2002). Osteoporosis has been defined by the consensus development conference as "a systemic skeletal disorder characterized by low bone mass and microarchitectuaral deterioration of bone tissue, with consequent increase in bone fragility and susceptibility to fracture."(Cooprer&etal, 2002). Clinically, osteoporosis is recognized by the occurrence of characteristic low trauma fractures. Furthermore any meaningful definition of osteoporosis must account for the risk of fracture. So using fracture, as a diagnostic criterion is advantageous since it is a direct event that can be easily formulated into a diagnostic algorithm. However the obvious disadvantage of this criterion is that diagnosis will be delayed in a disorder where prevention is an important end goal. As a result of this bone mineral density (BMD) has been used as non-invasive method for defining osteoporosis and for assessing bone mass in an

attempt to predict future fractures. Low BMD is one of the strongest independent risk factors for fracture (Cooper&etal, 2002).

Osteoporosis is easily confused with osteoarthritis, which is a form of arthritis that results in breakdown of the cartilage covering bone ends. However osteoporosis affects mainly the bones of the hip, wrist and particularly those in the mid-back. Thinning of the hip and the wrist bones as a result of osteoporoses make them prone to fracture with little truma, while the vertebrae thinning might cause them to collapse from relatively minor forces. (Arthritis Society, 2002). In 1994 WHO defined osteoporoses as "A disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk."(1999, WHO).

I-3 Physiology of bone growth/ loses:

Bone strength is directly correlated with the bone mass that is reflected in the actual bone BMD. Furthermore the peak bone mass achieved during growth and maturation affects the BMD at any age. Also the speed and amount of individual bone loss is affected by his/her sex, age, menopause, health status, medication use and finally his/her life style. Recently National Osteoporosis foundation (NOF) in their study suggested that peak bone mineral density is reached by the third decade of life and is influenced by sex, race, heredity and possibly by physical activity and nutritional status of the child and young adult (NOF, 2002). Bone is a dynamic tissue that is constantly being remodelled. This bone remodelling consist of new bone formation and bone loss so that bone mass remains constant. With age, imbalance in this process favours bone loss that results in a net loss of bone.

Structurally, bones are of two types. The first type is the trabecular bone, which forms the inner meshwork of the vertebrae pelvis, flat bones and the ends of long bones. This bone type constitutes only 20% of the skeleton but it has a large surface area and is sensitive to metabolic changes. The second type is Cortical or compact bone, which makes up 80% of the skeleton, forms the outer casing of all bones and is the major constituent of the shaft of long bones. The women bone loss that occurs with age results in a 35% reduction of cortical bone and a 50% reduction

of trabecular bone while men lose approximately 25% and 35% of cortical and trabecular bone respectively. (Gorddon & Haung, 1995).

With regard to osteoporosis two forms of aging-related primary osteoporosis are postulated. Postmenopausal, or type I osteoporosis occurs in women within 15-20 years after menopause. Rapid bone loss result from circulating estrogen reduction after menopause. Circulating estrogen decrease enhances bone remodelling with an excess of bone loss by resorption over bone formation. Estrogen deficiency is a natural consequence of menopause for all women; however only 10-20% of postmenopausal women manifest vertebral fractures due to type I osteoporosis. A preponderance of trabecular bone loss cause predominating vertebral crush fractures as will as colles (wrist or distal radius) fractures. Certain number of cases are not diagnosed because they are asymptomatic cases. Males may also experience hypogonadal bone loss, but type I osteoporosis is six times more common among women. Type II or senile osteoporosis occurs in one half of the women and one in four of the men over age 70. Trabecular and cortical bone loss occurs in both sexes with advancing age as a result of decreased bone formation. Bone loss may begin as early as 30-35 years of age, type II osteoporosis is characterized by hip and vertebral wedge fractures. (Gorddon & haung, 1995).

Briefly three stages of bone mass change occur over the human life span: the first stage is building of bone, which leads to attainment of peak bone mass. After closure of the growth plate at about the age of 20 years, radial growth continues for another 10-15 years. Most of the bone mass is acquired by 20-30 years of age. The second stage consists of a slow loss of bone. It begins around the age of 40 years for cortical bone and the age of 45-50 years for trabecular bone, continues till very old age and is probably similar in women and men. In women a third stage of transient accelerated postmenopausal bone loss is due to decreased estrogen. This bone loss is superimposed on the slow loss of bone (stage two above) and results in disproportionately more trabecular than cortical bone loss. During the last two stages, it is estimated that the slow phase produces a loss of 25% from each the trabecular and cortical bone, and the accelerated phase causes women to lose an additional 10% from trabecular and 25% from cortical components. During their lifetime women can lose up to 35% of their cortical bones and 50% of their trabecular bones while men bone loss is two-thirds of these amounts. So at the molecular level osteoblasts build bones and osteoclasts resorb them and this process is under the control of calcitriol,

I-5 Diagnosis of Osteoporosis:

Over the past 25 years, the methods of measuring bone density have evolved from insensitive procedures such as radiogrammetry to several more sensitive non-invasive procedure, including absorptiometry, computed tomography and ultrasound. According to Cooper "absorptiometric methods have been better validated and more widely used than computed tomography and ultrasound" (Cooper&Jordan, 2002). Mitlak and Nuussbaum in their review of bone densitometry stated: "Qualitative computed tomography (QCT) of the spine provides the most direct measure of trabecular bone and is the most sensitive for detection of early osteopenia. DXA is commonly used, due to its lower X-ray exposure, its better reproducibility in the long run and its lower cost." (Huang&Gordan, 1995)

Osteoporosis often cannot be detected by conventional X-ray until more than 25% to 40% of calcium in the bone is lost. Although alkaline phosphates may be elevated after osteoporotic fracture serum calcium, phosphorus, and alkaline phosphates levels usually are normal. BMD measurements are used to measure the bone density where it assesses the mass of bone per unit volume or how tightly the bone is packed. One of the most common procedures to measure bone density in the spine and hips (the most common sites of fractures due to osteoporosis) is the DXA. DXA studies are useful to evaluate changes in bone density over time and to assess the effectiveness of treatment. There are other method like Sahara; the first portable bone sonometer become available in 1998. It uses ultrasound to measure bone density at the heal. (Dirksen, 2001).

Bauer described the measurement of bone with densitometry as the "gold standard" test for the diagnostic evaluation of osteoporosis. Biomechanical studies demonstrate the bone mass accounts for 60% to 80% of the breaking strength of long bones and numerous clinical studies have found that measurement of bone mass is strongly predictive of future fracture events. (Bauer, 2002) The clinical utility of Quantitative Ultrasound (QUS) remains controversial. The strength of bone is determined not only by its material properties, as calcium content and microarchitecture, but also by geometric parameters. BMD have high specifity but low sensitivity for this reason measurement of BMD is more useful in the contex of a

case-finding strategy than for population screening e.g. the population at risk. (Metab &Others, 1998).

Biomechanical Bone Markers are usually characterized as those related to bone formation as serum alkaline phosphatase, osteocalcin, and propeptide type I procollagen, or bone resorption as urine hydroxyproline, total free deoxypyridinoline, and, serum bone sailoprotein. These tests measure the overall state of bone remodeling at a single point in time. Remodeling markers do not predict rates of bone loss. Bone resorption may help in the prediction of fracture risk in women >65 years, when bone density results are greater than usual treatment thresholds noted above. A high level of bone resorption should prompt consideration of treatment. The primary use of biochemical markers is for monitoring the response to treatment, they provide an earlier estimate of patient response than does bone densitometry. (Braunward, 2001).

I-6 Osteoporosis risk factors and preventive factors:

Knowing the detailed risk factors for osteoporosis is important to understand the pathophysiology of the disorder, contribute to clinical treatment and help in design of preventive strategies against fracture. Metab in the Osteoporosis Consensus development conference in Osaka 1998 lists the risk factors that can modify the rate of bone loss. In that conference Metab concentrated on the following major osteoporosis risk factors:

1- **Calcium intake (absorption -excretion) and protein intake:** It has been confirmed that low calcium diets increase bone resorption and lead to osteoporosis in adult experimental animals. (Metab& Others, 1998) It is increasingly clear that the calcium requirement depends on the associated intakes of other nutrients that effect calcium excretion (e.g. phosphorus, sodium, and protein) and also on vitamin D status that affects calcium absorption. Appropriate intake of these nutrients especially protein are important for body calcium balance. (Sausan, 2002)

2- **Estrogen:** Ophorectomy (ovary removal) is followed by increased bone resorption and consequent loss of bone in experimental animals. Evidence is

accumulating that this increase in bone loss by resorption is caused by the loss of estrogen that affects the gastrointestinal tract and kidneys functions as well as bone remodelling. (Metab&etal, 1998)

3- **Androgens:** Hypogonadism is an important risk factor in men and also low androgen levels have been reported in osteoporotic women. Androgen appears to stimulate bone formation. (Metab&etal, 1998)

4- **Body Mass:** Body mass correlates well with weight-bearing exercise and immobilization. Furthermore bone density is positively related to body mass. Weight- bearing exercises, positively effects bone formation probably because they increase body mobility and decrease body adipose tissue mass. Conversely, immobility leads to accelerated bone loss in the whole skeleton because it leads to sever increase in body mass. (Metab&etal, 1998)

5- **Corticosteroid Hormones:** The glucocorticoids are risk factors for osteoporosis because they depress bone formation but this effect may be aggravated by secondary hyperparathyroidism as the result of adverse effects on calcium absorption and excretion. (Metab&etal, 1998). An association between osteoporosis and high doses of oral corticosteroids (>10 mg prednisone per day) is well recognised. (Sambrook, 2000)."Since the use of inhaled corticosteroids is common and may increase further because of the rising prevalence of asthma, this finding may have substantial implications for public health. Patients who take cumulative doses of 5000 mg should be monitored by bone densitometry and considered for active intervention to reduce the risk of osteoporotic fracture in later life". (Sambrook, 2000).

6- **Thyroid hormones:** The thyroid hormones increase the rate of bone loss by resorption compared to bone formation. (Metab&etal, 1998)

7- **Parathyroid Hormone:** An excess of parathyroid hormone in primary hyperparathyroidism generally accelerates bone loss by resorption more than bone formation, although the effects are somewhat different in cortical and trabecular bone. (Metab&etal, 1998)

8- **Alcohol Intake:** High alcohol intake can lead to osteoporosis, possibly because of a depressive (toxic effect) on bone formation and a calciuretic

effect on the kidneys, but the pathophysiology of alcohol intake on osteoporosis is not fully understood. (Metab&etal, 1998)

9- **Smoking:** Epidemiological studies show that smoking increases the risk of osteoporosis, possibly by depression of calcium absorption and consequent increase in bone resorption. (Metab&etal,1998)

10- **Diuretics:** There is some evidence the thiazides may reduce fracture. Probably by lowering urine calcium, whereas loop diuretics have the reverse effect. (Metab&etal, 1998)

11- **Anticoagulant:** Both heparin and dicoumarol have been reported to cause osteoporosis after prolonged use, but the mechanisms are not well understood. (Metab&etal, 1998)

Besides these factors genetic make up is clearly the main determinant of bone density in childhood and young adult, which has a major effect on osteoporosis. However after the start of menopause in women there is a progressive bone loss of about 1% per annum and perhaps half that rate in men starting from midlife, which continues in both sexes to the end of their lives. Fracture risk doubles for every (SD) fall in BMD, and some individuals may lose as much as 1SD in 3 years from their BMD. So based on this findings it is clearly worthwhile to identify and correct the risk factors. (Metab&etal, 1998).

Cooper more recently grouped the risk factors into three categories: those that influence the risk of falling, those that influence the BMD through life course, and those that influence the skeletal strength independent of BMD. Another risk factors that Cooper mention are physical activity and weight, a review of physical activity and hip fracture showed a strong association with physical activity in leisure time and a weaker association with respect to activity at work. The association was presented from childhood to adult and consistent across geographical regions. It was estimated that to be physically active reduced the risk of later hip fracture by up to 50%. It was noted that even daily chores, as climbing stairs, also are protective. While low body weight is negatively correlated with peak bone mass and high adiposity is protective against the risk of both hip and vertebral fracture. Table-1 summarizes osteoporosis risk factors according to Cooper. (Cooper&Jordan, 2002).

Table-1: Risk factors for osteoporosis. (Cooper&Jordan, 2002).

Number	Risk factor
1	Age
2	Female sex
3	Body mass index
4	Maternal family history of hip fracture
5	Prior fragility fracture
6	Low BMD
7	Low birth weight
8	Genetic factors
9	Sex hormones
10	Premature menopause: A- Primary or secondary amenorrhea B- Primary or secondary hypogonadism in men
11	Disease states: A- Hyperparathyrodism B- Thyrotoxicosis C- Cushing's syndrome D- Inflammatory arthritis
12	Drugs: A- Corticosteroids B- Anti-convulsant C- Heparin
13	Smoking
14	Alcoholic
15	Dietary calcium and vitamin D.

Also Cooper supports the (programming) hypothesis were the growth trajectory may be programmed in utero or very early postnatal life and environmental factors at this stage may influence peak bone mass. So the embryo does not contain only a description of the person to whom it will rise to, it rather contain in its genes a generative program for making a person. Studies in both Britain and Sweden have provided evidence that weight in infancy is a determinant of bone mass in adulthood. Such as 153 women born in Bath were followed up till they are 21 years old. There was significant relationship between their weight at one year of age and their bone mineral content at 21 years of age. Further evidence for programming was demonstrated by a study of 144 neonates whose mothers had their characteristics assessed at 18 and 28 weeks of gestation. (Cooper&Javaid, 2002). Neonatal bone mineral content was positively correlated with birth weight, body length, and

placental weight. Maternal smoking and physical activity were negatively associated with neonatal bone mineral content. This implies that maternal nutrition can modify fetal nutrition and bone accretion. (Cooper&Javaid, 2002)

Our study concentrates on Palestinian women because some women worldwide can lose up to 20% of there bone mass in five to seven years after menopause, making them more susceptible to osteoporosis. Furthermore women who smoke one pack of cigarette per day through out their life will have an average deficit of 5-10% in spinal BMD by the time of the menopause. (NOF, 2002). Fortunately Palestinian women do not have this problem because we have very low number of smoking women in our Palestinian society.

Finally reversing all the above listed reversible osteoporoses risk factors is protective. Unfortunately some osteoporosis risk factors are irreversible such as age, sex, some genital defects, and menopause. Also moderate obesity appears to be protective with regard to osteoporosis in postmenopausal women. Apparently this type of obesity effect is related to greater skeleton loading and increased endogenous estrogens production in adipose tissue in these women patient with generalized osteoarthritis. Also these women appear to have an increased BMD but not necessarily a decreased risk of osteoporotic fracture. (NOF, 2002).

I-7 Drug Therapy:

1-Hormone replacement therapy (HRT). Estrogens is the treatment of choice for prevention of osteoporosis. Progestrons should be added to oestrogen in women with an intact uterus to reduce the risk of endometrial carcinoma. A history hypertention, stroke and ischemic heart disease are not contraindicated to HRT. In generally HRT is contraindicated in patients with a history of breast cancer and endometrial cancer. There is evidence to suggest that the risk of breast carcinoma may be slightly increased in healthy women who are long-term users of HRT > 10 years. (hasllett,etal, 1999). Estrogen replacement therapy after menopause is used to prevent osteoporosis. It is believed that estrogen inhibits osteoclast activity leading to

decreased bone resorption and preventing both cortical and trabecular bone loss. Although the exact mechanism of estrogen action is not known, the greatest benefit of estrogen treatment is in first 10 years after menopause. (Dirksen, 2001).

2-Calcitonin is another hormone that is involved in osteoporosis, which is secreted by the thyroid gland and inhibits osteoclastic bone resorption by directly interacting with active osteoclasts. This hormone is available as intramuscularly (IM), subcutaneous (S/C), and intranasal (I/N) forms. Its administration IM or S/C at night has been shown to decrease the side effects of nausea and facial flushing , however, nausea does not occur with I/N. Calcium supplementation must be given with calcitonin to prevent secondary hyperparathyroidism. . (Dirksen, 2001).

3-Biphosphonates is drug group used in osteoporosis therapy. Provide an alternative to HRT for the prevention and treatment. They inhibit osteoclast-mediated bone resorption, so their use increase BMD and bone mass (5-10%). This group includes alendronate 10mg daily with calcium supplements is effective in both the prevention and treatment of established osteoporosis in post-menopausal women. It should be taken with 8-ounce glass of water to decrease GI side effect and increase its absorption . Etidronate (400mg daily for 2 weeks, followed by 13 weeks calcium supplements) has similar effects. (haslett,etal. 1999).

4-Calcium supplements are widely used as an adjunct to other treatment in the prevention and treatment of osteoporosis. When used alone calcium do not increase bone mass but slow bone loss. It should be considered in all post-menopausal women with osteoporosis who are taking less than the recommended intake of 1500 mg daily.

5-Parathyroid hormone (PTH). Treatment with PTH increases levels of bone formation markers such as osteocalcin , and also increases bone resorption marker levels as collagen N-telopeptide cross-links. In a study by Cosman and Colleagues bone turnover marker levels increased rapidly, peaking after 6-12 months of treatment with PTH and returning to baseline values by end of 36-month trial. Associated with this changes BMD increased 12% at the lumbar spine and 3% for total body among women taking HRT who had PTH added, compared with little or no change in those

receive HRT alone. In addition to effects on BMD, PTH reduces vertebral fractures by 65% to 69%. (Women's Health, 2001).

6-Other treatment as selective estrogen receptor modulator as (raloxifen) are used in treatment of osteoporosis, also vitamin D and active vitamin D metabolites may have a role in the treatment of established osteoporosis and prevention of hip fracture. Sodium fluoride can give impressive increases in bone mass 30% or more, but the therapeutic window is narrow. The role of fluoride in the treatment of osteoporosis is controversial. (haslett,etal. 1999).

I-8 Prevention of Osteoporosis (WHO):

Bone density, which is the most important factor determining bone strength, is affected by a number of different factors, some of which are beyond the individuals control, such as their own genetics, however, there are a significant number of ways in which bone loss can be prevented and minimized throughout life. These prevention strategies focus on:

1- **Achieving the greatest possible bone density peak during the growth of our bones:** The maximum bone density peak that an individual can achieve is dependent to a large extent on his/her genetics, race and gender. By applying these criteria it has been shown that Caucasian women have the lightest and black men having the heaviest skeletons. However, a number of modifiable factors also influence bone mass peak, these factors include calcium intake, vitamin D intake, exercise and hormonal status during the first 24 years of life which is the period of bone growth. The national osteoporosis foundation recommends that each individual to have 1200 mg/day calcium intake, and 3-4 hours of exercise per week during the first 24 years of life. Also adolescents should be encouraged to avoid excessive alcohol consumptions and cigarette smoking to help protect their bones. The maximum bone density peak achieved will help protect against future osteoporosis, where the individual who achieves a

high bone density peak will be able to withstand the gradual loss of bone that occurs with age than a person who achieves a lower bone density peak. (WHO, 1999).

2- **Preventing bone loss:** After the individual has reached bone density peak in their early-to mid thirties prevention focuses on strategies that can help to minimize bone loss:

A- **Adequate calcium intake:** Increasing calcium intake reduces fracture risk where for each 300 mg increase in calcium intake the fracture risk is reduced by 3%. Also calcium intake should be increased with age to compensate for the reduced calcium absorption and to ensure that the calcium stores from bones are not used to maintain calcium homeostasis in the body. Furthermore the national osteoporosis foundation recommends that premenopausal women take at least 1000 mg of calcium per day and that postmenopausal women take 1500 mg per day. However, surveys have shown that calcium intake is often inadequate where many middle-aged and older women take only 500 mg of calcium per day or less. (WHO, 1999).

Table-2 **Recommended Optimal Calcium Intake.** Source: (US National institute of health, 1994).

INFANTS	
Birth to 6 months. 6 months to 1 year.	400mg/day 600mg/day
Children and Young adults	
1 to 5 years. 6 to10 years. 11 to 24 years.	800mg/day 800 to 1200 mg/day 1200 to 1500mg/day
Adult Men	
Men 25 to 65 years. Men over 65 years.	1000mg/day 1500mg/day
Adult Women	
Women 25 to 50 years including women on estrogen therapy.	1000mg/day (add 600 to 900 mg) during pregnancy and lactation
Postmenopausal women not on estrogen therapy and women over 50 years age.	1500mg/day

B- Vitamin D: 700 units/day Vitamin D, and 1500 mg/day calcium, have been reported to reduce fracture risk in men and women over 65 years of age. The body ability to synthesize vitamin D decreases with age and since it is essential for calcium absorption from the intestine, adequate dietary vitamin D will help to restore the balance and maintain calcium homeostasis in older person.

C-Exercise: By increasing the levels of physical activity the mechanical forces applied to the skeleton promote bone growth and prevent bone loss with age. In a group of healthy postmenopausal women 22 months of weight-bearing exercise increased the bone mineral density of the lumbar spine by 6.1%. The exact nature of the relationship between exercise and the bone mass is not yet fully understood and the type of weight -bearing exercise that is most effective in preventing bone loss has not yet been identified. (WHO, 1999) Exercise also enhances coordination and balance, which may help to prevent falls.

D- **Life style changes:** Bone loss has been strongly associated with smoking and excessive alcohol consumption. So by stopping smoking and reducing alcohol consumption may help to protect the skeleton from progressive bone loss. (WHO, 1999).

In order for Public health policy makers to identify the best method for preventing osteoporosis, they should start with energetic case finding by selective screening of high-risk populations as women who have undergone early menopause, patients on corticosteroids, and individuals with significant family histories of osteoporosis or fracture. We hope our work here will lead to recommendations to the Palestinian health ministry on how to prevent osteoporosis among the high-risk Palestinian women .

I-9 Epidemiology/ prevalence worldwide

Metab reported that osteoporosis affects more than 75 million people worldwide including 4-5 million people in Japan where the life expectancy is the longest in the world. Furthermore osteoporosis causes more than 2.3 million fractures annually in Europe and the US. (Metab&Others, 1998). In one of the best-studied countries epidemiologically, osteoporosis is a major public health threat for an estimated 44 million Americans with 10 million individuals (8 million women and 2

million men) are estimated to already have the disease. Also low bone mass is estimated to affect 34 million people in the US, including 55% of the people above 50 years old, which puts them at increased risk of developing osteoporosis and fracture. Furthermore 5% of non-Hispanic black women over 50 years old are estimated to have osteoporosis and an additional 35% have low bone mass. On the other hand 10% of Hispanic women over 50 years old are estimated to have osteoporosis and 49% of them are estimated to have low BMD. Osteoporosis also affects 20% of non-Hispanic white and Asian women over 50 years old and 52% of them are estimated to have low BMD. From osteoporosis related fracture point of view one in two women and one in four men over 50 years old will have an osteoporosis related fracture in their lifetime up to 1.5 million fractures annually (300,000 hip fracture, 700,000 vertebral fracture, 250,000 wrist fractures and 300,000 fractures at other body sites. (NOF, 2002).

Davidson emphasises that an estimated cost of fractures is more than $13.8 billion annually to the health care system. Also one in two women over 50 years old will sustain an osteoporosis related fracture during their life, and women who sustain a fracture between ages 20-50 years have a 74% increased risk of fractures over 50 years old. (Davidson, 2002)

Fractures are the most confirming symptoms for osteoporosis. However when they happen its to late to interfere with the course of the disease. The cost of treating osteoportic fractures is too high for the health care system as will as to the patient. Some of the important osteoporotic fractures features are discussed below according to their importance:

1- **Hip Fracture:** It occurs every 20-second worldwide. Since the average population age is increasing due to the improvement of health care the occurrence of hip fracture will increase to one every 2 second by the middle of the next century. (Kanis, 1998). The majority of hip fracture occurs in women over 80 years old for two reasons. First by 80 years of age just 3% have normal BMD and 70% have osteoporosis, defined as 2.5 SD below the mean value of bone mass peak in young adult women. Second most women aged below 50 years have normal BMD (That is not more than 1 standard deviation (SD) below the mean value of bone mass peak in young adult women). (Kanis, 1998) The hip fracture often results in

complete loss of mobility, with half of all patients permanently losing the ability to walk independly after a fracture. So 61,000 hip fractures are admitted to nursing home each year in U.S. Hip fracture are associated also with increased mortality between 12%-20% within 1 year. Data from recent survey conducted by the US congress office confirm previous finding that hip fractures are a considerable burden personally and economically in both the short and long term. Their cost for individuals who have to stay in nursing home over one year as result of hip fracture is 93,878 US$. (WHO, 1999)

2- **Vertebral Fracture:** Vertebral fracture is common in postmenopausal women with osteoporosis. They are often insidious and most are not reported. It is estimated that 3% of women at age of 50 years will have a vertebral fracture, and this percentage increases to 40% at the age of 80 years. The incidence of this fractures increases 20 fold in women between the ages of 60-90 years and reduction in the quality of their life is marked. The reduction of life quality is followed by spinal deformity that reduces the ability of patients to perform simple day activities. Furthermore vertebral fracture results in 150,000 admissions to hospital, 160,000 visits to the physician and 5 million days of restricted activity in the US each year and multiple vertebral fractures result in the characteristic Dowagers hump.(WHO,1999).

3- **Colles Fracture:** Colles' fractures at the distal radius increase dramatically in women in the first 5 years after menopause and peak between the ages 60-70 years. The incidence falls off after this time because the protective arm reflex, which is usually initiated during fall, is impaired with advancing age. The lifetime risk of a colles' fracture is 15% in American women. Also hand pain is experienced by 29-44% of patients, 36-40% have weakness of the hand or reduced grip strength. While colles' fractures produce less morbidity than hip or vertebral fractures, they still use significant health care resources, resulting in 50,000 hospital admissions, 400,000 visits to

the physician and 6 million days of restricted activity in people aged over 45 years in the US. (WHO, 1999).

As we are looking for improving health status of Palestinian women in holistic approach and improve the primary health care. This study is done about osteoporosis in Palestinian women. Osteoporosis affect 75 million people worldwide half of them women (Davidson, 2002). Also osteoporotic hip fracture is predicted to exceed 6 million fractures annually by the year 2050 (Keen, 1999). Over 75% of these fractures are expected to occur in developing countries such as Palestine and management strategies should be conducted . So our current study of osteoporosis in Palestinian women incidence, prevalence, risk factors and protective factors (prevention) will contribute to the specific management strategies of osteoporosis in Palestinian women. Furthermore the number of antiresorptive therapies for treatment and prevention of osteoporosis is increasing, and the most logical and probably most cost effective, management option will undoubtedly be prevention. BMD is the strongest predictor of future fracture so our retrospective study will depend on BMD measurement as will as the occurrence of osteoporotic fractures such as hip fracture, vertebral fracture and Colles' fractures to confirm osteoporoses in Palestinian women cases.

Conceptual framework

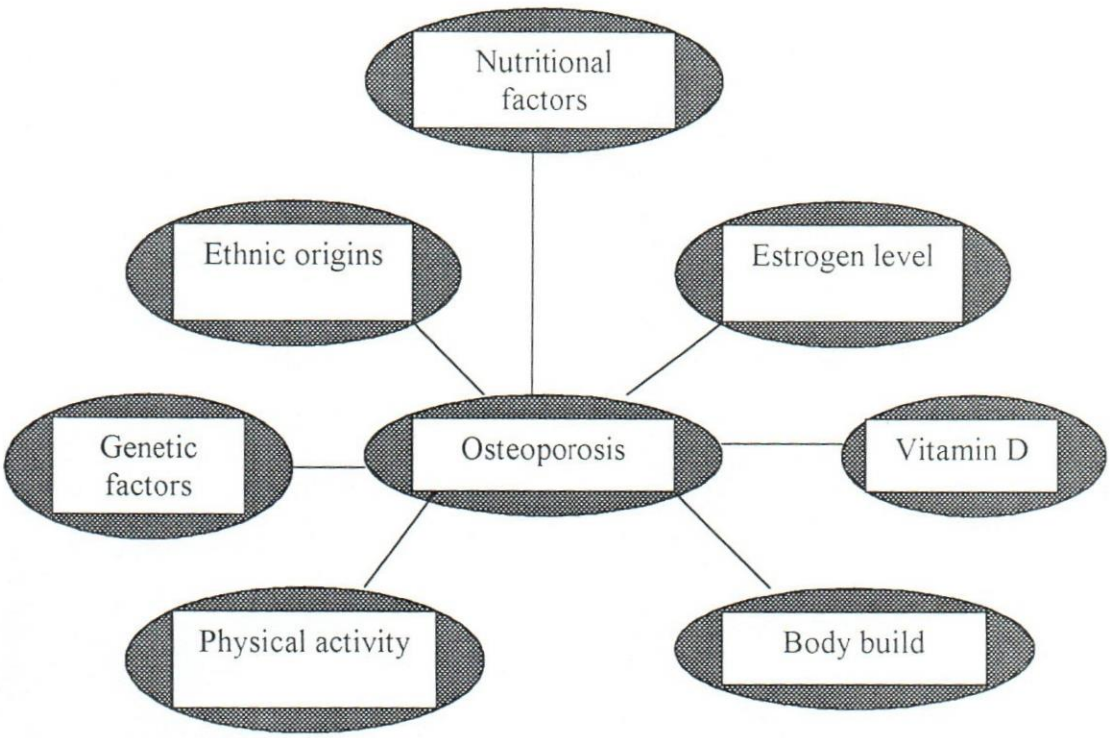


FIGURE-2-Osteoporosis is a multifactorial disease.

2-Material and Methods:

2-1 Methodology:

Research design: Our study is a descriptive retrospective analytical study used to identify the prevalence, risk factors and protecting factors of osteoporosis in Palestinian women. The questionnaire that we used, presented in medical files (appendix), was standardized by international society of osteoporosis. This questionnaire was used before in a pilot universal study of osteoporosis.

Sampling: The sample of our study consists of all medical records of Palestinian women who attended to performed bone densitometry at Palestinian Osteoporosis Preventive Center (POPS) during the years 2000,2001 and 2003. We included all medical files to get adequate sample for statistical analysis which will reflect results as close as possible to reality. Our sample consists of 338 medical files of Palestinian women. We divided the sample to three groups of women based on their BMD:

1- Women have osteoporosis t.score <-2.5.
2- Women have osteoporosis t.score between –1 to –2.5.
3- Women have normal BMD t.score>-1.

Setting: POPS, Beit Jala- west bank.

BMD Test in Palestinian Osteoporosis Preventive Society Diagnostic Center:

The society is one of the NGOs that was established in 1999 in beet Jala. It provides the BMD test to all Palestinian population. The women come to the society to do BMD test after they are referred by their health practitioners or by themselves. Also marketing for this test is done periodically throw different media and every day the test is performed by trained person.

Furthermore doctors, trained persons and dietitians work as a team throw the following steps of the test:

- Explanation for the client about the procedure and what is required.
- Performing the test.
- Explanation of the test result and curves.
- Explanation of diet by dietitian.
- Describe therapeutic management.
- Provision client with education material as pamphlets and appointment for next visit if need.

Ethical Considerations: Official letter sent by my advisor Prof. Mahmoud Abu-hadid to the president POPS. The society allowed us to conduct our study. So our study was conducted with full confidentiality of the subject information.

Instruments: The questionnaire that we used presented in medical files (appendix). This questionnaire is divided to the following categories:

1- General information from question (7-10).
2- Medical information from question (11-28).
3- Life style from question (29-38). \ medication from question(39-42).
4- Risky diseases and fracture.
5- BMD result of spine .

Data Collection: our data collection and entry on SPSS from the medical records of 338 subject was condected.

Methods of data analysis:

1- The answers for each category of questions of the questionnaire was tabulated.
2- Variables correlation was done.

3- Comparison between women with osteoporosis and normal women were carried out in terms of risk factors and protecting factors.

2-3 DXA Periodic Maintenance And Quality Control:

The QDR450 elite uses multi-element detector array fan-beam geometry for performing high speed scans, the precision: < 1.0%. Values are reported as estimated area and BMC as a convenience. The daily quality control (QC) procedure tests the system performance by performing a self-test followed by a scan of the QC phantom. The QC procedure is mandatory. It must be performed daily before patients are scanned. The users must add scan result to the QC database. If the coefficient variation (CV) of database exceeds 0.8% it should be reported to a Hologic authorized service representative. The Coefficient of variation is the standard deviation expressed as a percent of the mean. The smaller the CV percentage the better the precision of the result.

CV=100 X (SD/MEAN).

The value of SD for the lumbar spine=. 00806g/cm2.

The significant different change in BMD that considered statistically significant (at 95% confidence) between two scan of patient is 0.023g/cm2. This value is a minimum significant difference between two lumbar spines, which cannot be attributed to measurement error with 95% confidence. Appendix 2 shows us the plot statistics and reference values for the instrument during 2000-2003, which emphasis the validity of this instrument.

2-3 DXA –WHO: The DXA is an accepted instrument worldwide for BMD measurement. It provides a safe and convenient method for measuring BMD accurately, reproducibly and with minimal radiation exposure. Studies have shown that BMD has a normal population distribution in subjects of all ages in both sexes. Fracture risk increases 1.5-3 fold for each SD fall in BMD. A woman at the age of menopause who's hip BMD is 1 SD below average will have a 30% greater fracture

risk in her remaining lifetime. The WHO has proposed that both BMD and fracture be combined in a stratified definition of osteoporosis. Based on that four categories were recommended:

1- Normal: a value for BMD that is not more than 1SD below the young adult BMD mean value.
2- Osteopenia: a value for BMD that lie between 1 and 2.5 SDs below the young adult BMD mean value.
3- Osteoporosis: a value for BMD is more than 2.5 SDs below the young adult BMD mean value.
4- Severe Osteoporosis: a value for BMD more than 2.5 SDs below the young adult BMD mean value in the presence of one or more fragility fractures.

3 –RESULTS

A- Data Analysis:

Data collection and coding were done to all medical files for women who performed BMD at Palestinian Society of Osteoporosis. Upon completing the data collection and coding, we prepared it for statistically analysis using SPSS.

The questions were analyzed according to four categories. The first category is the demographic data. The second category is the medical information and family history. The third category is the life style including physical activities, diet, cigarettes smoking, drinks (caffiene&alcohol), and general health. While the last category is medications usage, and common risky diseases. The total number of our sample was 338. In our results we concentrate on comparing the two major groups namely the normal BMD group and osteoporosis group in terms of protecting factors and risky factors. Chi-square tests were used for analysis.

B-Presentation Of Results:

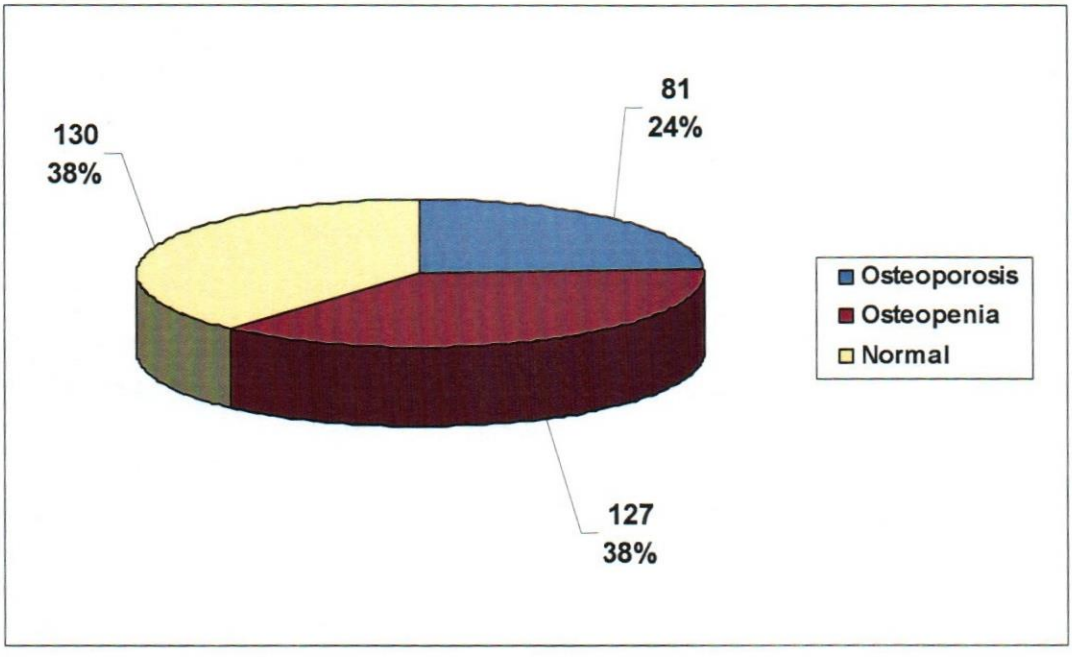


Figure-3: The pie shows the percentage of osteopenia, osteoporosis, and normal BMD. Total sample 338 cases.

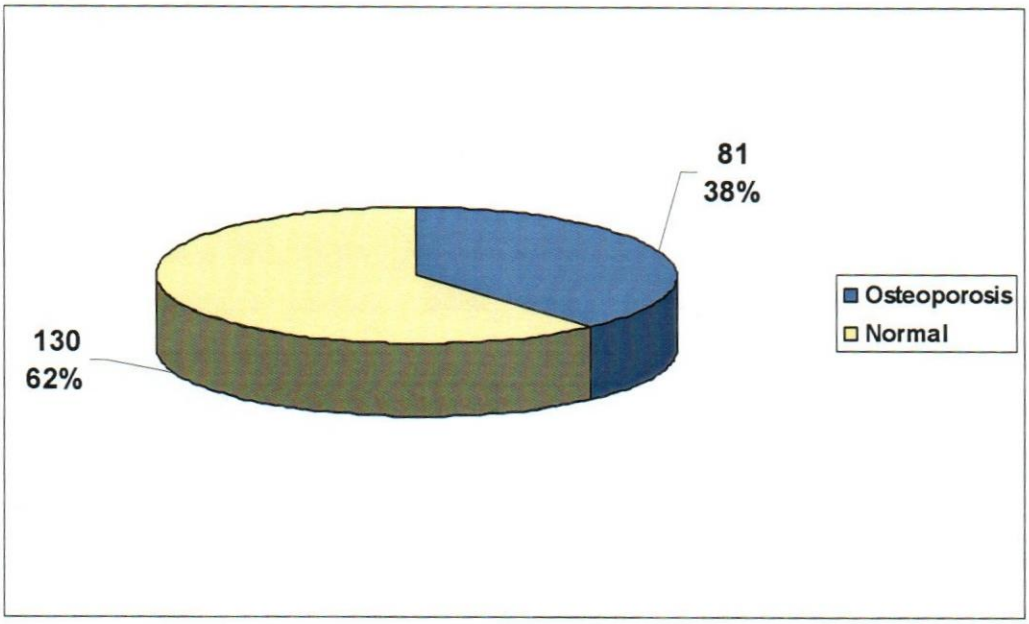


Figure-4: The pie shows comparison between normal BMD and osteoporosis.

1-Demographic Data.

The following tables show the comparison between Osteoporotic women and women with normal BMD. According to residence, social economic statues, age groups, BMI, height, weight and difference between height at 25 years and age when BMD done.

Table-3: The mean for weight, height and body mass index.

	Minimum	Maximum	Mean	Std. Deviation
Weight in Kg	39.000	108.000	73.22330	13.053311
Height in centimeters	140.00	170.00	156.4396	5.82137
BMI	18.05	45.88	29.89	5.12323
Different ht.	0	25	5.4615	4.6522

Table-5: Residence effects on Osteoporosis

Residence		Total spine (t score)		Total
		Osteoporosis	Normal	
Flat	Count	4	6	10
	% of Total	1.9%	2.8%	4.7%
Villa	Count	77	123	200
	% of Total	36.5%	58.3%	94.8%
Village	Count	0	1	1
	% of Total	0	.5%	.5%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

Table-6: Social and Economic Statues effects on Osteoporosis

Social and Economic Statue		Total spine (t score)		Total
		Osteoporosis	Normal	
High	Count	4	3	7
	% of Total	1.9%	1.4%	3.3%
Medium	Count	65	112	177
	% of Total	30.8%	53.1%	83.9%
Low	Count	12	15	27
	% of Total	5.7%	7.1%	12.8%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

Table-7: Age category effects Osteoporosis.

Age Group		total spine (t score)		Total
		Osteoporosis	Normal	
20-30	Count	3	10	13
	% of Total	1.4%	4.7%	6.2%
31-40	Count	3	30	33
	% of Total	1.4%	14.2%	15.6%
41-50	Count	7	41	48
	% of Total	3.3%	19.4%	22.7%
51-60	Count	25	30	55
	% of Total	11.8%	14.2%	26.1%
61-70	Count	27	10	37
	% of Total	12.8%	4.7%	17.5%
71-80	Count	15	8	23
	% of Total	7.1%	3.8%	10.9%
81-90	Count	1	1	2
	% of Total	.5%	.5%	.9%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.000

Table-7: Height effects on Osteoporosis.

Height groups in centimetres (now)		total spine (t score)		Total
		Osteoporosis	Normal	
140-145	Count	7	1	8
	% of Total	3.4%	.5%	3.9%
146-150	Count	12	9	21
	% of Total	5.8%	4.3%	10.1%
151-155	Count	27	29	56
	% of Total	13.0%	14.0%	27.1%
156-160	Count	20	53	73
	% of Total	9.7%	25.6%	35.3%
161-165	Count	11	28	39
	% of Total	5.3%	13.5%	18.8%
166-170	Count	2	8	10
	% of Total	1.0%	3.9%	4.8%
Total	Count	79	128	207
	% of Total	38.2%	61.8%	100.0%

P Value = 0.001

Table-8: Weight in Kg effects on Osteoporosis.

		Total spine (t score)		Total
Weight Category in Kg (Now)		Osteoporosis	Normal	
30-40	Count	1	0	1
	% of Total	.5%	0	.5%
41-50	Count	2	2	4
	% of Total	1.0%	1.0%	1.9%
51-60	Count	22	12	34
	% of Total	10.7%	5.8%	16.5%
61-70	Count	24	28	52
	% of Total	11.7%	13.6%	25.2%
71-80	Count	20	43	63
	% of Total	9.7%	20.9%	30.6%
81-90	Count	6	24	30
	% of Total	2.9%	11.7%	14.6%
91-100	Count	2	14	16
	% of Total	1.0%	6.8%	7.8%
101-110	Count	1	5	6
	% of Total	.5%	2.4%	2.9%
Total	Count	78	128	206
	% of Total	37.9%	62.1%	100.0%

P Value = 0.001

Table-9: Body Mass Index (BMI) {BMI= WT./ (HT.XHT.)} effects on Osteoporosis.

BMI Category		Total spine (t score)		Total
		Osteoporosis	Normal	
15-25	Count	18	19	37
	% of Total	8.7%	9.2%	18.0%
26-35	Count	43	66	109
	% of Total	20.9%	32.0%	52.9%
36-45	Count	14	35	49
	% of Total	6.8%	17.0%	23.8%
46-55	Count	3	8	11
	% of Total	1.5%	3.9%	5.3%
Total	Count	78	128	206
	% of Total	37.9%	62.1%	100.0%

P Value = 0.234

Table-10: Difference in height effects on Osteoporosis.

Different in height		Total spine (t score)		Total
		Osteoporosis	Normal	
0-5	Count	20	70	90
	% of Total	12.8%	44.9%	57.7%
6-10	Count	26	21	47
	% of Total	16.7%	13.5%	30.1%
11-15	Count	5	9	14
	% of Total	3.2%	5.8%	9.0%
16-20	Count	1	2	3
	% of Total	.6%	1.3%	1.9%
21-25	Count	1	1	2
	% of Total	.6%	.6%	1.3%
Total	Count	53	103	156
	% of Total	34.0%	66.0%	100.0%

P Value = 0.000

2- Medical Information: The following tables show the comparison between Osteoporotic women and women with normal BMD according to medical information provided by them.

Table-11: The mean of women age who participated in our study at period start and stop.

	Minimum	Maximum	Mean	Std. Deviation
Age when period started	10	20	13.56	2.002
Age when period stopped	25	58	47.33	6.170

Table-12: Age when period started effects on Osteoporoses.

Age groups when period started		Total spine (t score)		Total
		Osteoporosis	Normal	
10	Count	1	2	3
	% of Total	.5%	1.0%	1.4%
11	Count	2	12	14
	% of Total	1.0%	5.7%	6.7%
12	Count	13	28	41
	% of Total	6.2%	13.3%	19.5%
13	Count	20	34	54
	% of Total	9.5%	16.2%	25.7%
14	Count	20	22	42
	% of Total	9.5%	10.5%	20.0%
15	Count	10	20	30
	% of Total	4.8%	9.5%	14.3%
16	Count	7	8	15
	% of Total	3.3%	3.8%	7.1%
17	Count	3	1	4
	% of Total	1.4%	.5%	1.9%
18	Count	2	1	3
	% of Total	1.0%	.5%	1.4%
19	Count	0	1	1
	% of Total	0	.5%	.5%
20	Count	2	1	3
	% of Total	1.0%	.5%	1.4%
Total	Count	80	130	210
	% of Total	38.1%	61.9%	100.0%

Table-13: Age when period stopped effects on Osteoporosis.

Age groups when periods stopped		Total spine (t score)		Total
		Osteoporosis	Normal	
<35	Count	4	2	6
	% of Total	3.3%	1.7%	5.0%
36-45	Count	28	8	36
	% of Total	23.1%	6.6%	29.8%
46-55	Count	38	34	72
	% of Total	31.4%	28.1%	59.5%
56-65	Count	3	4	7
	% of Total	2.5%	3.3%	5.8%
Total	Count	73	48	121
	% of Total	60.3%	39.7%	100.0%

P Value = 0.063

Table-14: Years after menopauses effects on Osteoporosis.

No. of Years		Total spine (t score)		Total
		Osteoporosis	Normal	
1-10 years	Count	21	24	45
	% of Total	17.8%	20.3%	38.1%
11-20 years	Count	23	9	32
	% of Total	19.5%	7.6%	27.1%
21-30 years	Count	24	8	32
	% of Total	20.3%	6.8%	27.1%
31-40 years	Count	5	4	9
	% of Total	4.2%	3.4%	7.6%
Total	Count	73	45	118
	% of Total	61.9%	38.1%	100.0%

P Value = 0.041

Table-15: Hysterectomy effects on Osteoporosis.

Hysterectomy		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	10	9	19
	% of Total	4.7%	4.3%	9.0%
No	Count	71	121	192
	% of Total	33.6%	57.3%	91.0%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.181

Table-16: Ovaries removal effects on Osteoporosis.

ovaries removal		Total spine (t score)		Total
		Osteoporosis	Normal	
yes	Count	8	8	16
	% of Total	3.8%	3.8%	7.6%
no	Count	72	122	194
	% of Total	34.3%	58.1%	92.4%
Total	Count	80	130	210
	% of Total	38.1%	61.9%	100.0%

P Value = 0.308

Table-17: Age at time of ovaries removal effects on Osteoporosis.

Age groups at time of ovary removal		Total spine (t score)		Total
		Osteoporosis	Normal	
0-35	Count	76	124	200
	% of Total	36.0%	58.8%	94.8%
36-60	Count	4	6	10
	% of Total	1.9%	2.8%	4.7%
> 60	Count	1	0	1
	% of Total	.5%	0	.5%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

Table-18: Pregnancy effects on Osteoporosis.

Pregnant		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	70	113	183
	% of Total	33.2%	53.6%	86.7%
No	Count	11	17	28
	% of Total	5.2%	8.1%	13.3%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

3- Life style: The following tables show the comparison between Osteoporotic women and women with normal BMD regarding information they provided about their life styles.

Table-19: Sport activities effects on Osteoporosis.

Sport activities scale (childhood)		total spine (T score)		Total
		Osteoporosis	Normal	
No information	Count	0	1	1
	% of Total	0	.5%	.5%
No (0)	Count	16	18	34
	% of Total	7.6%	8.5%	16.1%
Poor	Count	20	24	44
	% of Total	9.5%	11.4%	20.9%
3 hours/week	Count	11	7	18
	% of Total	5.2%	3.3%	8.5%
Sportive (Daily)	Count	34	80	114
	% of Total	16.1%	37.9%	54.0%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.039

Table-20: Sport activities between the ages (25-52 years) effects on Osteoporosis.

Sport activities between (25-52 years) of age scale		Total spine (t score)		Total
		Osteoporosis	Normal	
No information	Count	0	2	2
	% of Total	0	.9%	.9%
No (0)	Count	33	47	80
	% of Total	15.6%	22.3%	37.9%
Poor	Count	33	53	86
	% of Total	15.6%	25.1%	40.8%
3 hours/week	Count	8	12	20
	% of Total	3.8%	5.7%	9.5%
Sportive (Daily)	Count	7	16	23
	% of Total	3.3%	7.6%	10.9%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.706

Table: 21. Sport activities (After 52 Years) effects on Osteoporosis.

Sport activities after the age of 52 Years scale		Total spine (t score)		Total
		Osteoporosis	Normal	
No information	Count	20	82	102
	% of Total	9.5%	38.9%	48.3%
No (0)	Count	38	31	69
	% of Total	18.0%	14.7%	32.7%
Poor	Count	17	14	31
	% of Total	8.1%	6.6%	14.7%
3 hours/week	Count	3	3	6
	% of Total	1.4%	1.4%	2.8%
Sportive (Daily)	Count	3	0	3
	% of Total	1.4%	0	1.4%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.000

Table-22: Drinking milk (up to 25 years of age) effects on Osteoporosis.

Drinking milk (up to 25 years of age) scale		Total spine (t score)		Total
		Osteoporosis	Normal	
No information	Count	0	3	3
	% of Total	0	1.4%	1.4%
Every meal	Count	5	6	11
	% of Total	2.4%	2.8%	5.2%
Every day	Count	40	42	82
	% of Total	19.0%	19.9%	38.9%
Every week	Count	10	28	38
	% of Total	4.7%	13.3%	18.0%
Less than once a week	Count	26	51	77
	% of Total	12.3%	24.2%	36.5%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.064

Table-23: Drinking milk between 25 to 50 years of age effects on Osteoporosis.

Drinking milk between 25 to 50 years of age scale		Total spine (t score)		Total
		Osteoporosis	Normal	
No information	Count	1	9	10
	% of Total	.5%	4.3%	4.7%
Every meal	Count	2	2	4
	% of Total	.9%	.9%	1.9%
Every day	Count	39	43	82
	% of Total	18.5%	20.4%	38.9%
Every week	Count	16	35	51
	% of Total	7.6%	16.6%	24.2%
Less than once a week	Count	23	41	64
	% of Total	10.9%	19.4%	30.3%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.100

Table-24: Drinking milk above 50 years of age effects on Osteoporosis.

Drinking milk above 50 years of age scale		Total spine (t score)		Total
		Osteoporosis	Normal	
No information	Count	14	82	96
	% of Total	6.6%	38.9%	45.5%
Every meal	Count	0	3	3
	% of Total	0	1.4%	1.4%
Every day	Count	39	22	61
	% of Total	18.5%	10.4%	28.9%
Every week	Count	9	12	21
	% of Total	4.3%	5.7%	10.0%
Less than once a week	Count	19	11	30
	% of Total	9.0%	5.2%	14.2%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.000

Table-25: Smoking cigarettes effects on Osteoporosis.

Smoking cigarettes		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes now	Count	11	16	27
	% of Total	5.2%	7.6%	12.8%
Not now but in the past	Count	9	15	24
	% of Total	4.3%	7.1%	11.4%
Never	Count	61	99	160
	% of Total	28.9%	46.9%	75.8%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

Table-26: Frequency of drinking alcoholic beverages in the past year effects on Osteoporosis.

Frequency of drinking alcoholic beverages in the past year		Total spine (t score)		Total
		Osteoporosis	Normal	
Every day	Count	0	1	1
	% of Total	0	.5%	.5%
1-2 days a week	Count	1	0	1
	% of Total	.5%	0	.5%
Less than once a week	Count	2	3	5
	% of Total	.9%	1.4%	2.4%
Not at all	Count	78	126	204
	% of Total	37.0%	59.7%	96.7%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.525

Table-27: Caffeine drinking effects on Osteoporosis.

Number of Caffeine Drinks/wk.		Total spine (t score)		Total
		Osteoporosis	Normal	
1-5	Count	60	72	132
	% of Total	28.4%	34.1%	62.6%
6-10	Count	20	46	66
	% of Total	9.5%	21.8%	31.3%
11-15	Count	0	9	9
	% of Total	0	4.3%	4.3%
16-20	Count	1	3	4
	% of Total	.5%	1.4%	1.9%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.015

Table-28: The mean of number Of cigarettes and caffeine drinks/ day.

	Minimum	Maximum	Mean	Std. Deviation
Number of coffee cups /day	0	15	2.53	2.407
Number of tea cups /day	0	15	1.73	2.180
Number of soft drinks (like cola) /day	0	6	.69	.954
Number of cigarettes smoked/ day	0	50	2.93	7.536

Table-29: General health description and Osteoporosis.

General Health description		Total spine (t score)		Total
		Osteoporosis	Normal	
Very good	Count	1	6	7
	% of Total	.5%	2.8%	3.3%
Good	Count	58	109	167
	% of Total	27.5%	51.7%	79.1%
Satisfactory	Count	4	5	9
	% of Total	1.9%	2.4%	4.3%
Not so good	Count	18	9	27
	% of Total	8.5%	4.3%	12.8%
Poor	Count	0	1	1
	% of Total	0	.5%	.5%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.014

4- Risky diseases and medication: The following tables show the comparison between Osteoporotic women and women with normal BMD regarding risky diseases and medication.

Table-30: Had ever taken female hormones or estrogens effects on Osteoporosis

Had ever taken female hormones or estrogens?		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	10	16	26
	% of Total	4.7%	7.6%	12.3%
No	Count	71	114	185
	% of Total	33.6%	54.0%	87.7%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

Table-31: dysthyrodism effects on Osteoporosis.

Do you have Disthyrodism		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	8	8	16
	% of Total	3.8%	3.8%	7.6%
No	Count	73	122	195
	% of Total	34.6%	57.8%	92.4%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.321

Table-32: Chronic Rheumatic diseases effects on Osteoporosis.

Chronic Rheumatic diseases		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	7	0	7
	% of Total	3.3%	0	3.3%
No	Count	74	130	204
	% of Total	35.1%	61.6%	96.7%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.001

Table-33: Personal Fracture History effects on Osteoporosis.

Fracture history		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	16	20	36
	% of Total	7.6%	9.5%	17.1%
No	Count	64	110	174
	% of Total	30.5%	52.4%	82.9%
Total	Count	80	130	210
	% of Total	38.1%	61.9%	100.0%

Table-34: Steroid therapy effects on Osteoporosis.

Uses of drugs (Steroid)		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	5	1	6
	% Of Total	2.4%	.5%	2.8%
No	Count	76	129	205
	% of Total	36.0%	61.1%	97.2%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

P Value = 0.022

Table-35: Hypertension effects on Osteoporosis.

Hyperytension		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	11	10	21
	% of Total	5.2%	4.7%	10.0%
No	Count	70	120	190
	% of Total	33.2%	56.9%	90.0%
Total	Count	81	130	211
	% of Total	38.4%	61.6%	100.0%

Table-36: Diabetes Type I & II effects on Osteoporosis.

Diabetes Type I & II		Total spine (t score)		Total
		Osteoporosis	Normal	
Yes	Count	5	7	12
	% Of Total	2.4%	3.3%	5.7%
No	Count	76	123	199
	% Of Total	36.0%	58.3%	94.3%
Total	Count	81	130	211
	% Of Total	38.4%	61.6%	100.0%

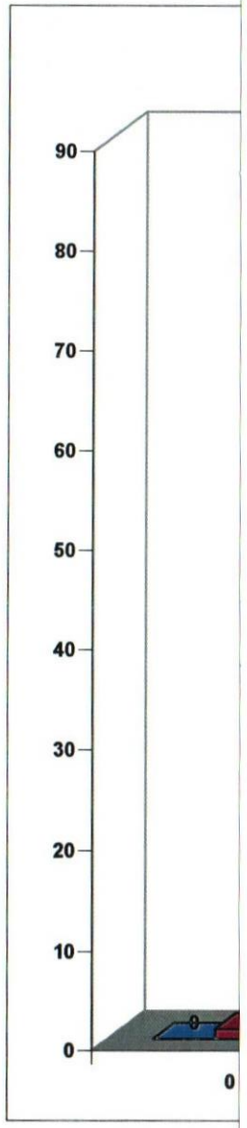
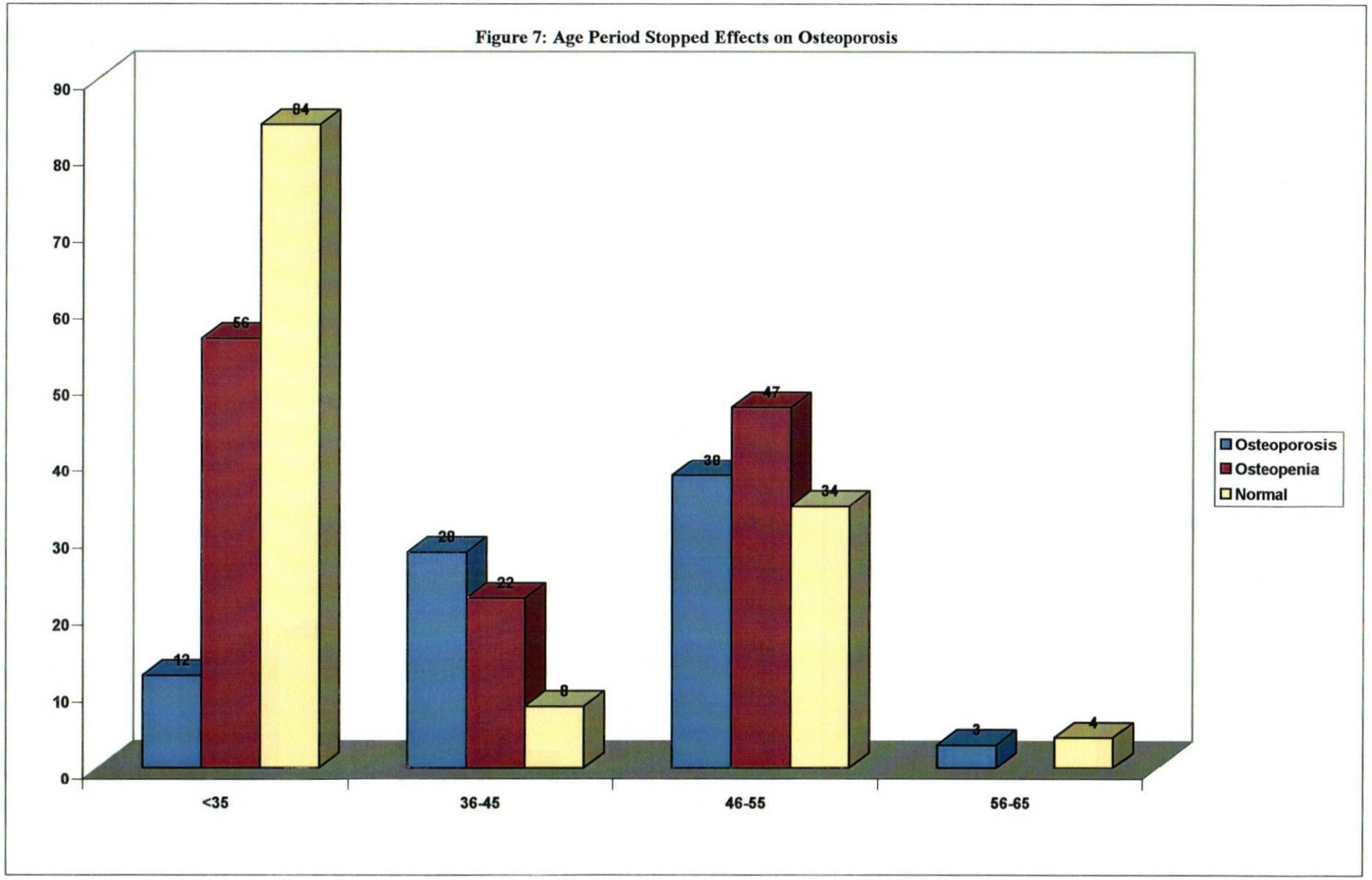


Figure 7: Age Period Stopped Effects on Osteoporosis



Figur 9: Sport Activities (25-50 years) Effects on Osteoporosis

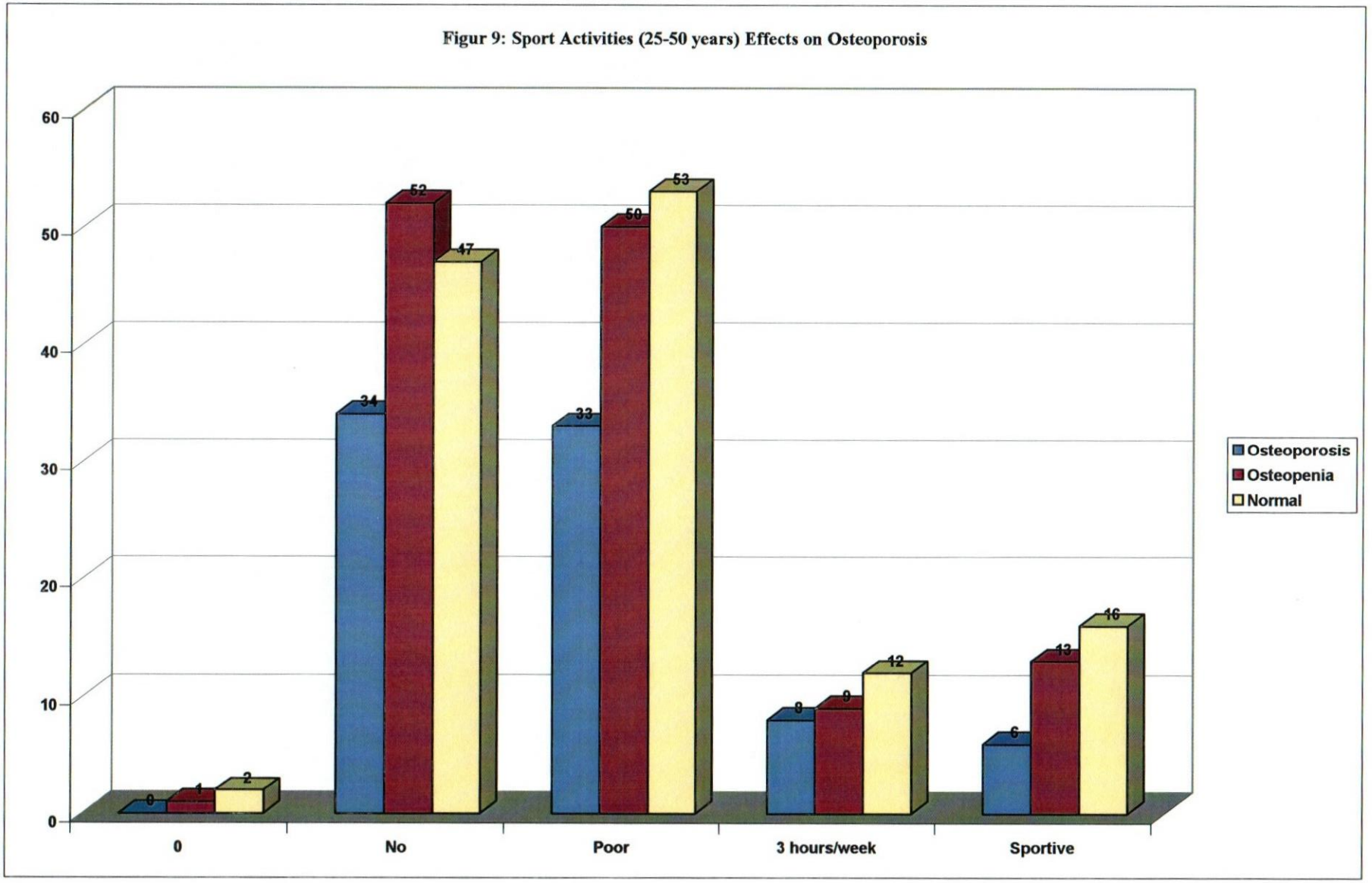


Figure 10: Sport Activities (after 50 years) Effects on Osteoporosis

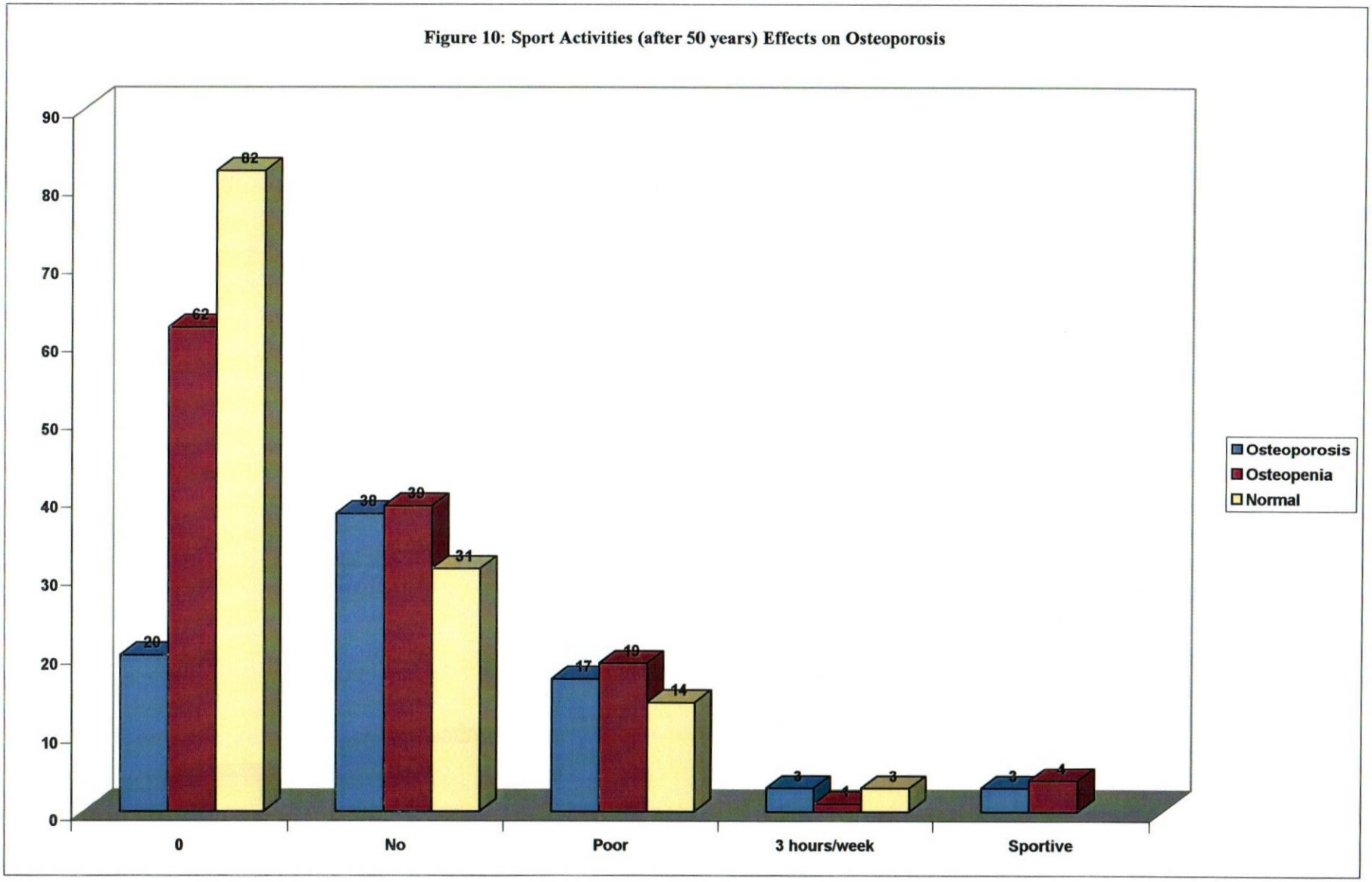


Figure 12: Drinking Milk (25 to 50 years) Effects on Osteoporosis

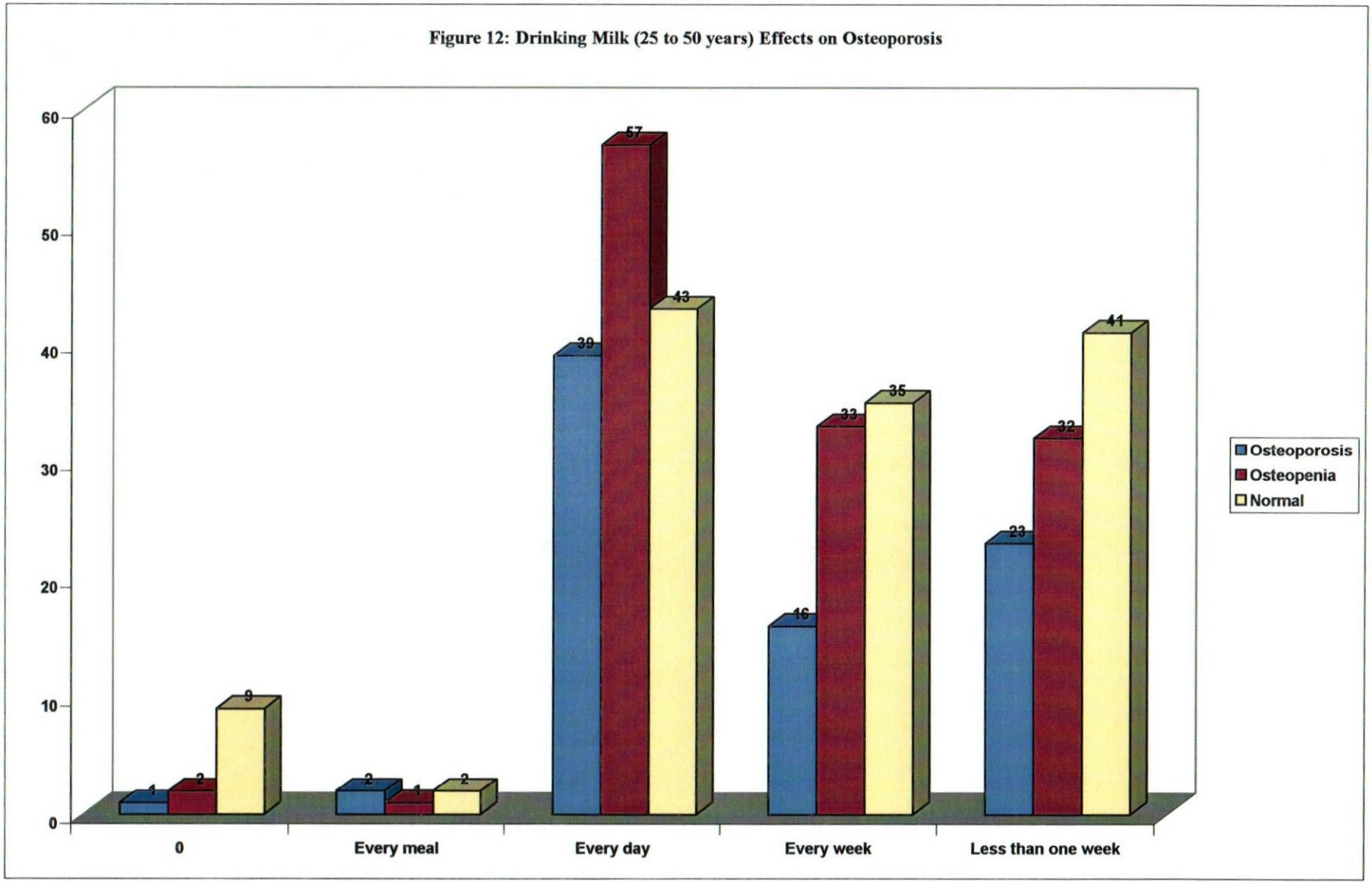
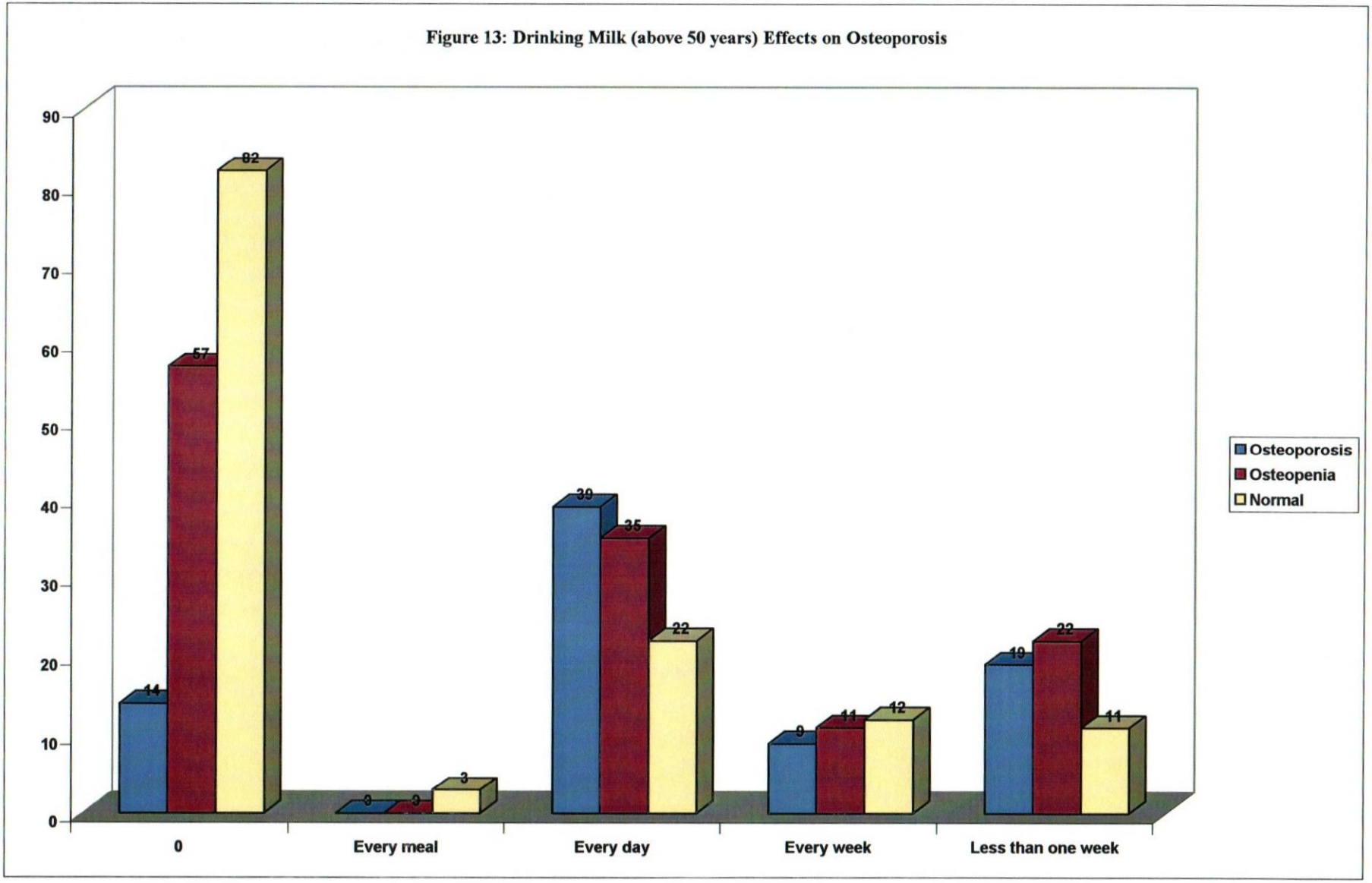


Figure 13: Drinking Milk (above 50 years) Effects on Osteoporosis



4-DISCUSSION

A-Major findings:

After we analyzed our data as shown in the results we found the following:

1- **The demographic data:** Our demographic data Show that residence has no effect on osteoporosis, the majority of our sample lives in flat no one from village. This may be due perhaps to lack of awareness for densitometry or to villager women life style. Also there was no effect of socioeconomic status on osteoporosis. The economic status is a hidden issue in our community, the major answer was good and thank to god. The bad political situation plays a major role in the economic status especially in recent years. Study in Lebanon in March 2003 show that the lowest awareness is among lower income society categories. (MSD, 2003).

Bone loss begins at ages 30-40 years, with an annual loss of 0.3-1 % of peak bone mass. During the first 5-6 years after menopause 3-5% bone loss take place. While by the age of 70, 11% of bone loss was related to menopause and 18% was related to effect of age alone (Gordon&Huang, 1995). Women can lose 20% of their bone mass 5-6 years after menopause (NOF, 2002). Aging significantly affect the incidence and severity of osteoporosis (P value was 0.000).

Height and weight have significant effect on osteoporosis (P=0.001) for both. Also the decrease in height from the height at 25 years of age to the time when the test is done was significant (P=0.004). The height at 25 years of age depended on subjective data and what is written in the passport, so error may be present. Furthermore low body weight is negatively correlated with bone mass peak, low BMI and weight. Also these factors are strongly correlated with fracture risk compared with higher adiposity, which is protective against the risk of both hip and vertebral fractures (Cooper, 2002). The mean of BMI was 29.8 with SD=5.1 this emphasis that obesity is major problem among Palestinian women due to nutritional habits beside

depression and stress they face in their hard life. Also the political situation requires from the Palestinian women many additional roles.

2- Medical information:

Our medical information data analyses show that no significance of either maternal or father history of fracture (P=0.200) while worldwide data indicate that 70% of variance in BMD might be due to genetics makeup (Elsevier, 2002). The mean of age at period start in our sample was 13 SD= 20, while the mean of age at period stop was 47 with SD=6.17. Our mean at the period stop was consistent with study in Lebanon. Where the mean of age at period stop was 46.2 with SD=3.83. (MSD, 2003). In contrast universally the mean of age at period stop is about 51. Furthermore decrease of estrogen amounts over a long time due to early menopause or surgical removal of ovary induced osteoporosis. The years of menopause categories was significance on osteoporosis the P=0.041.

With regard to pregnancy, which included live birth, miscarrage, stillbirth and breast-feeding was not significant at our study P=0.900. The fertility rate is high in west bank 5.61/100,000. And this means that Palestinian women have high parity. There is an overall decrease in the maternal bone loss of up to 10% during pregnancy (Elsevier, 2001). Nulliparous women have higher rates of hip fracture than parous women. So pregnancy may induce biomechanical changes in the hip that later protect women from fracture. A study found that parous women had greater hip cross-sectional area, subperiosteal width, estimated cortical thickness, and cross sectional modulus of inertia (Bauer, 2002). Cross sectional study of duration of lactation and BMD has shown a positive correlation. Breast-feeding for 12 months reduced the risk of hip fracture by 40-50% after adjusting for age. In our study no significance of breast-feeding and number of children on BMD.

In epidemiological studies of age at menopause and fracture risk. Women who had bilateral ovarectomy had two to three times the risk of hip fracture of postmenopausal women who had a natural menopause (Gordon&Huang, 1995). Our hysterectomy and overectomy result was not significant P=0.100 and 0.300

respectively. Also the age of overectomy was not significant P=0.400. At our country overectomy may be done at late age beside that number of overectomy in our sample was small.

3- Life style:

Our life style data analysis, which included milk consumption, sport activities and caffeine drink, has high significance while alcoholic and smoking have no significance.

Sport activities in childhood and above 52 years of age has high significance the P=0.03, 0.00 respectively, While sport activity between 25-52 years of age is not significant P=0.5. Furthermore milk consumption in childhood and above 52 years of age has high significance P=0.060, 0.000 respectively, while milk consumption between 25-52 years of age is not significance P=0.100. We can explain these result as follows, peak bone mass is reached between 16-25 years of age so adequate intake of calcium beside sport will help to increase peak bone mass. After 52 years of age the body will start to lose bone so adequate intake of calcium beside sport will help to replace this loss. In boys from 13-16 years of age and from 11-14 years of age girls lumber spine and proximal femur increase by 4-6 fold over these 3 years. Nearly one third of spinal peak bone mass is accrued during adolescence (Elsevier,2001).

Alcoholic women are not present in our community. Furthermore, Smoking itself has no significance effect on osteoporosis in our study, but the age when the women started to smoke was significant P=0.060, also the average number of cigarette was only 3/day. Smoking among women is rare in our community and only takes place at special occasion. Smoking 20 cigarettes/day for 10 years reduces bone density by about 2 S.D or 0.2 T score (Eggelmeijer, 1998).

Caffeine drinks effects osteoporosis with high significance P=0.015. The mean for caffeine drinks Coffee 3 cups/day, tea 2 cups/day, and cola 1 cup/day. Caffeine increases urinary calcium excretion. Women avoid milk drinking due to abdominal

distention, gasses (lactose intolerance) and consume other drinks like tea, cola, coffee and artificial juice which lead to obesity.

The result of the questions that describe general health was significant P=0.020 the quality of life of osteoporotic patients is less than normal. Medication prescribed to them will decrease the negative effect of the diseases and make them feel better. Last year NOF World Osteoporosis Day theme was "Invest in your bones" while the next year theme will be "The quality of life".

4- Risky diseases and medication.

Rheumatic disease has significant effects on Osteoporoses P=0.001. The rheumatic patients received cortisone for treatment and they lack activity. Cortisone treatment has significant on osteoporosis occurrence P=0.020. Glucocorticoid - induced osteoporosis may develop where 50% of patients who take steroids for six months or longer. Including low doses of glucocorticoids, and inhaler, have bone loss, but the dose below which bone is not affected remains unclear. It appears that doses exceeding 7.5mg/day. The pathogenesis is multifactorial and complex. The major event is the decreased active life span of osteoplasts. (Eggelmeijer, 1997)

Hypertension and diabetics type 1&2 are not significant at our study P=0.100. In a non-published study revealed that 50% of the Palestinian population would develop diabetes or hypertension after the age 50 years. (Nashef, 2002).

Personal fracture history was not significant for osteoporosis to occur P=0.300. Women who sustain a fracture between ages 20-50 years have a 74% increased risk of fractures after age 50. One of two women older than 50 years will sustain an osteoporosis -related fracture during her life. (Davidson&Desimone, 2002).

Dysthyrodism, Medication like calcium, heparin, thiazid, calcitonin and estrogen therapy was not significant at our study. Lack of awareness about the intake of calcium the women might take it with caffeine drinks. Lack of awareness about the use HRT after menopause also the Palestinian authority didn't cover the HRT. In study done in august, 2002 in emergency medicine they concluded that

postmenopausal hormones not for every women, they suggest that in the absence of classic menopausal symptoms, hormone replacement can be detrimental to quality of life. (Emergency Medicin, 2003).

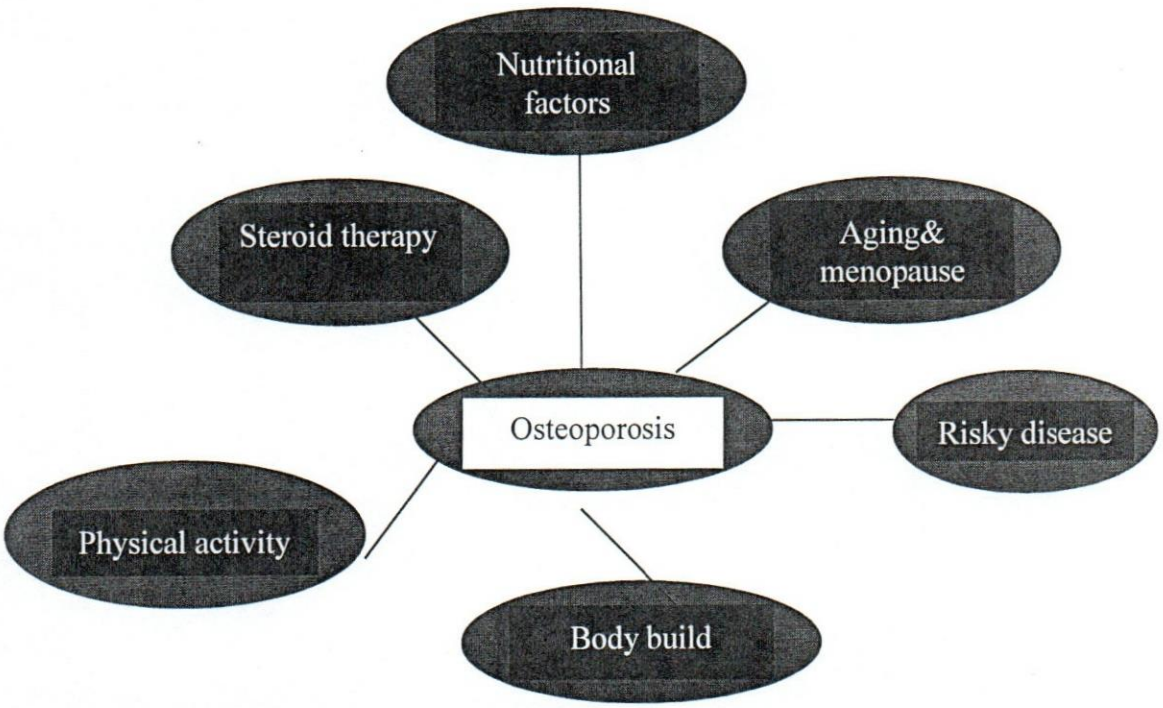
B-CONCLUSION

In light of the present findings the following conclusion can be drawn:

Osteoporosis could be a major problem among Palestinian women in fact 24% of our sample at all ages tested. One of four Palestinian women testing by DXA is having osteoporosis. So this disease needs more attention in Palestinian women.

Risk factors that have significance in our study were:

1- Aging and menopause.
2- Loss of height and the low body weight.
3- Early menopause.
4- Life style, which include poor sport activity, low consumption of milk, caffeine drinks and early age of smoking.
5- Risky diseases such as rheumatic disease.
6- Medication as steroid therapy.



These significant risk factors are following the same worldwide pattern. We would like to shed light on significant points presented at our study among women.

1. Obesity was a major problem that needs more concentration.
2. Palestinian women and Lebanon women has early menopause as compared with universal statistics for women worldwide.
3. The Palestinian culture has a big role in occurrence of osteoporosis so increase awareness must be the first priority.
4. Awareness is more important than socioeconomic status to over come Osteoporoses.
5. No awareness about Hormone Replacement therapy and estrogen therapy.
6. No implementation of healthy life style such as healthy nutrition and exercise. Healthy food must include adequate calcium, during reproductive age, pre-conception, menopause, and post menopause.
7. Prevention should start with energetic case finding by selective screening of high-risk populations as women who have undergone early menopause and patients on corticosteroids.
8. BMD test is a golden standard test for the diagnostic evaluation of osteoporosis.

Although our sample was small, it is sufficient to support our conclusions. We emphasis the importance of early screening and prevention of this silent diseases throw increasing awareness. This helps to decrease cost, fracture, morbidity, and increases the quality of life for Palestinian women.

C- Recommendation For Further Research:

Based on our study we recommend the following topics:

1- Awareness of osteoporosis risk factors among Palestinian women.
2- Role of health school education to prevent osteoporosis.
3- Measure the validity of diagnosing osteoporosis based on risk factor assessment.
4- Bone mineral density of the Palestinian reference population.
5- Epidemiology of fractures in Palestine.
6- The relation between fructose intolerance and osteoporosis.
7- Effect of hormone replacement therapy on menopausal women.
8- Quality and quantity of health services provided to women in non-reproductive age.
9- Assessment of health Services for osteoporosis.
10- The demographic characteristics of Palestinian women.
11- Prevalence of obesity among Palestinian women.
12- Role of the media in increasing awareness of osteoporosis.
13- Vitamin D deficiency and osteoporosis.

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ANNEX II

This questionnaire consists of 12 pages.
Please answer every question.
If you do not understand a question, please ask your doctor or the study nurse for further explanation.
In case you have to choose between Yes, No or don't know, please tick only one box:

Example:

Yes [X] No [ ] don't know [ ]

All your answers will remain confidential and will only be used for this clinical study

A. GENERAL INFORMATION

1. **What is your First name:** _____
2. **What is your middle name:** _____
3. **What is your last name:** _____
4. **What is our Husband name:** _____
5. **What is your Address:** _____
   Number Street
   _____
   District City
   Phone number Fax Mobile
6. **Occupation:** _____
7. **Residence:** Flat ☐ Villa ☐ Village ☐
   Bedouin ☐ High Income
8. **Social & Economic Statue:** High ☐ Medium ☐ Low ☐
9. **What is your date of birth:** _____ / _____ / _____
   day month Year
10. **How old are you:** _____ Years

B. MEDICAL INFORMATION

11. What was your height at the age of 25 years?

☐.☐☐ Meters Don't know ☐

12. What ~~was~~ is your height now? ☐.☐☐ Meters

13. What was your Weight at the age of 25 years?

☐.☐☐ kg Don't know ☐

14. What ~~was~~ is your Weight now? ☐.☐☐ kg

15. Has your mother ever suffered any of the following fracture after the age of 50?

- Vertebra: Yes ☐ No ☐ Don't know ☐
- Hip: Yes ☐ No ☐ Don't know ☐
- Rib: Yes ☐ No ☐ Don't know ☐
- Forearm: Yes ☐ No ☐ Don't know ☐
- Others: Yes ☐ No ☐ Don't know ☐

16. Has your Sister ever suffered any of the following fracture after the age of 50?

- Vertebra: Yes ☐ No ☐ Don't know ☐
- Hip: Yes ☐ No ☐ Don't know ☐
- Rib: Yes ☐ No ☐ Don't know ☐
- Forearm: Yes ☐ No ☐ Don't know ☐
- Others: Yes ☐ No ☐ Don't know ☐
- No sister ☐

23. Did your periods stop for longer than six months (others than pregnancy) before your menopause?

Yes ☐ No ☐ Don't know ☐

24. Have you had a hysterectomy?

Yes ☐ No ☐ Don't know ☐

If Yes,

How old were you at the time? ☐☐ Years

25. Have you had an ovary removed?

Yes ☐ No ☐ Don't know ☐

If yes,

- How many ovaries were taken ? One ☐ Two ☐ Don't know ☐
- How old were you at the time? ☐☐ Years

26. Have you taken female sex hormones at any time around or after your menopause?

Yes ☐ No ☐ Don't know ☐

If Yes,

- When were they started ? months ☐☐ years ☐☐
- When were they last taken? months ☐☐ years ☐☐
- Have you taken it for a continuous period of longer than 1 year?

Yes ☐ No ☐ Don't know ☐

27. Have you ever been **pregnant**? (include stillbirths and miscarriages)

Yes ☐ No ☐ Don't know ☐

If Yes,

How many pregnancies resulted in the birth of a **live child**?

☐☐

How many pregnancies lasted six months or more but ended in **stillbirth**?

☐☐

How many pregnancies lasted no longer than six months but ended in **miscarriage**?

☐☐

28. Did you **breast-feed** your children? Yes ☐ No ☐

If yes

How many children did you breast-feed for longer than 3 months?

☐☐ Children

C. LIFE STYLE

29. Sport Activities (walking, Bicycle, Basket Tennis....) During

- Childhood: No ☐ Poor ☐ 3 hours /Week ☐ Sportive ☐
- 25-52 years: No ☐ Poor ☐ 3 hours /Week ☐ Sportive ☐
- After that: No ☐ Poor ☐ 3 hours /Week ☐ Sportive ☐

30. How much time do you typically **spend walking** or on a **bicycle** out of doors each day?

None ☐

Some, but less than half an hour ☐

Half to one hour ☐

More than one hour ☐

31. How much time do you spend working in your garden /Land?

Yes ☐ No ☐

If yes, how many hours ☐☐☐ /Monthly

32. Please tell me how many days in the past week, did you eat each of the following milk products:

- Hard cheese ☐ days per week
- Soft cheese ☐ days per week
- Yogurt ☐ days per week
- Milk ☐ days per week
- Other (e.g. ice cream) ☐ days per week

33. For the periods indicated below, **mark the words that best describe** ho often you drank **milk** (include whole, low fat, and skim)

a) when I was young (up to 25 years), I drank milk:

- About every meal (3 or more glasses a day) ☐
- About every day but not every meal (1-2 glasses a day) ☐
- Every week but not every day ☐
- Less than once a week ☐

b) when I was aged 25-50 years, I drank milk:

- About every meal (3 or more glasses a day) ☐
- About every day but not every meal (1-2 glasses a day) ☐
- Every week but not every day ☐
- Less than once a week ☐

c) from age 50 on, I drank milk:

- About every meal (3 or more glasses a day) ☐
- About every day but not every meal (1-2 glasses a day) ☐
- Every week but not every day ☐
- Less than once a week ☐

34. Do you smoke **cigarettes** or other forms of tobacco?

Yes now ☐ Not now but in the past ☐ Never ☐

35. If you have ever **smoked cigarettes**?

- How old were you when you first started smoking? ☐☐
- How many on **average** do / did you smoke **a day**? ☐☐
- If you have now stopped, **how old** were you when you stopped? ☐☐

36. Which of these statements comes closest to describing how often you drank any **alcoholic beverages** in the past year?

- Every day ☐
- 5-6 days a week ☐
- 3-4 days a week ☐
- 1-2 days a week ☐
- Less than once a week ☐
- Not at all ☐

37. How many cups of **caffeine** containing beverages (coffee, tea, soft drinks like cola) do you drink every day?

- Coffee ☐
- Tea ☐
- Soft drinks (like cola) ☐

35. If you have ever **smoked cigarettes**?

- How old were you when you first started smoking? ☐☐
- How many on **average** do / did you smoke **a day**? ☐☐
- If you have now stopped, **how old** were you when you stopped? ☐☐

36. Which of these statements comes closest to describing how often you drank any **alcoholic beverages** in the past year?

- Every day ☐
- 5-6 days a week ☐
- 3-4 days a week ☐
- 1-2 days a week ☐
- Less than once a week ☐
- Not at all ☐

37. How many cups of **caffeine** containing beverages (coffee, tea, soft drinks like cola) do you drink every day?

- Coffee ☐
- Tea ☐
- Soft drinks (like cola) ☐

Fluoride _____ ☐ Yes ☐ No

40. Have you ever taken female hormones or estrogens?

☐ yes
☐ No

If yes,
Please fill or out chart below.

41. Which estrogen preparation? Wha

☐ Estrogen pill_____
☐ Estrogen skin patch_____
☐ Estrogen skin gel_____
☐ Estrogen vaginal cream or suppository_____

Year started Are you now using? Year

☐ Yes
☐ No

42. Daily Calcium intake by mg ☐ yes ☐ N

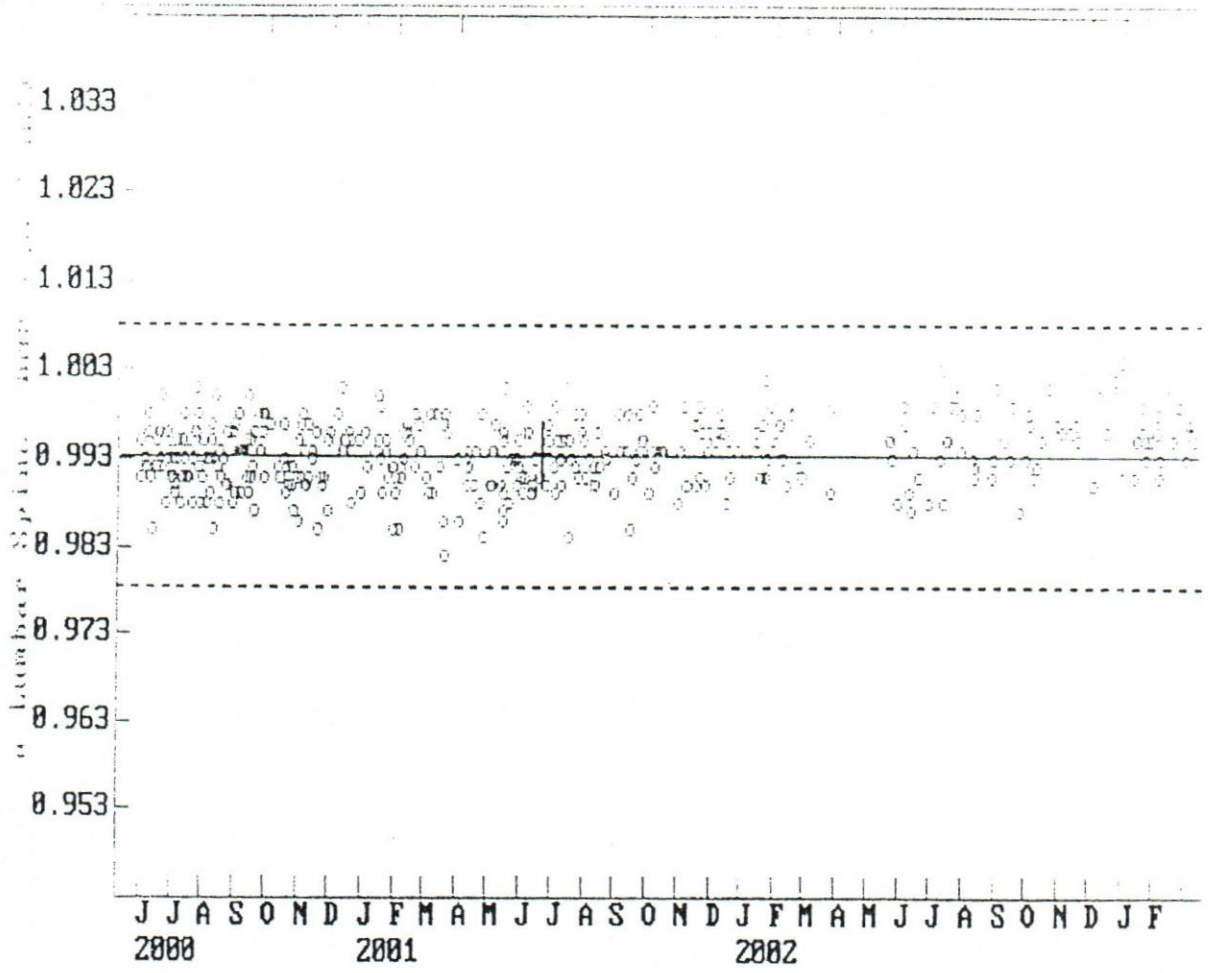
If Yes,

- Childhood ☐☐☐☐
- Teenager ☐☐☐☐
- Adult ☐☐☐☐
- Now ☐☐☐☐

E. DO YOU HAVE THE FOLLOWING?

- ☐ Hyperthyroidism
- ☐ Hypothyroidism
- ☐ Hyperparathyroidism
- ☐ Hyperporathyroidism
- ☐ Cushing Syndrome
- ☐ Kidney Disease (creatinin > 140 mmol /L)
- ☐ Chronic Liver Disease
- ☐ Malabosrption disease
- ☐ Hypoadrenalism
- ☐ Chronic Rheumatic diseases
- ☐ Congenital Skeleton diseases
- ☐ History of fracture:
  - ☐ Vertebrae ☐ Hip ☐ wrist ☐ Ribs
- ☐ Uses of the following drugs more than 3 months:
  - ☐ Bisphosphoante ☐ Calcitonin ☐ Litium ☐ Thiazides
  - ☐ Androgen ☐ Heparin ☐ Steroid ☐ ovulation stimulation Drugs
- ☐ Bedridden more than one month recently
- ☐ Senile dementia
- ☐ Parkinson Disease
- ☐ Epilepsy
- ☐ Para or quadriplegia
- ☐ Replaced joints
- ☐ Severe osteoarthritis of the lumbar spine

Appendix '2'



Reference Values	Plot Statistics
spine phantom #7801	n = 389
mean = 0.9934 gms/cm2	mean = 0.9935 gms/cm2
S.D. = 0.0045 gms/cm2	S.D. = 0.0037 gms/cm2
limits = ±1.5% of mean	cv = 0.37%

PALESTINIAN OSTEOPROSIS CENTER (45803)

HOLOGIC