A Survey on Knowledge of Osteoporosis and Attitude and Practice towards Precaution of Osteoporosis among University Students in Dhaka City

A dissertation submitted to the Department of Pharmacy, East West University in the partial fulfillment of the requirement for the Degree of Bachelor of Pharmacy.

Submitted by

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Declaration by the Research Candidate

I, Nagib Ahmed, hereby declare that the dissertation entitled "**A Survey on Knowledge of Osteoporosis and Attitude and Practice towards Precaution of Osteoporosis among University Students in Dhaka City**" submitted by me to the Department of Pharmacy, East West University and in the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a record of original research work carried out by me during the period 2015-2016 of his research in the Department of Pharmacy, East West University,Dhaka, under the supervision and guidance of Nafisa Tanzia, Lecturer, Department of Pharmacy, East West University and the thesis has not formed the basis for the award of any other degree/diploma/fellowship or other similar title to any candidate of any university.

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Certificate by the Supervisor

This is to certify that the thesis entitled "**A Survey on Knowledge of Osteoporosis and Attitude and Practice towards Precaution of Osteoporosis among University Students in Dhaka City**" submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a record of original and genuine research work carried out by Nagib Ahmed during the period 2015-2016 of his research in the Department of Pharmacy, East West University, under the supervision and guidance of me. The thesis has not formed the basis for the award of any other degree/diploma/fellowship or other similar title to any candidate of any university.

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Certificate by the Chairperson

This is to certify that the thesis entitled "**A Survey on Knowledge of Osteoporosis and Attitude and Practice towards Precaution of Osteoporosis among University Students in Dhaka City**" submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a record of original and genuine research work carried out by Nagib Ahmed during the period 2015-2016 of his research in the Department of Pharmacy, East West University.

Dr. Shamsun Nahar Khan

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Dedicated to my

Mother

TABLE OF CONTENTS

List of Abbreviations

AI- Aromatase Inhibitors

ARI- Absolute Risk Increase

BMC- Bone Mineral Content

BMD- Bone Mineral Density

BMI- Body Mass Index

BMDm- Bone Mineral Density measurement

BUA- Broadband Ultrasound Attenuation

CR- Canadian Rheumatologists

CYP- Cytochrome P450

DMPA- Depot Medroxyprogesterone Acetate

DXA- Dual energy X-ray Absorptiometry

FDA- Food and Drug Administration

FEA- Finite Element Analysis

FSH- Follicle Stimulating Hormone

GC- Glucocorticoids

GIOP- Glucocorticoid Induced Osteoporosis

GnRH- Gonadotropin Releasing Hormone

GP- General Practitioner

H2RA- Histamine 2 Receptor Antagonist

HRCT- High Resolution Quantitative Computed Tomography

HRMRI- High Resolution Magnetic Resonance Imaging

HRT- Hormone

HSA- Hip Structure Analysis

IU- International Unit

LH- Luteinizing Hormone

Micro-CT- Micro Computed Tomography Micro-

MRI- Micro Magnetic Resonance Imaging

NaF- Sodium Fluoride

O&G- Obstetricians and Gyencologists

OP- Osteoporosis

PoM- Post menopausal

PPI- Proton Pump Inhibitor

PrM- Pre menopausal

PTH- Para Thyroid Hormone

QCT- Quantitative Computed Tomography

QUS- Quantitative Ultrasound

RANKL- Receptor Activator of Nuclear factor Kappa B Ligand

RA- Rheumatoid Arthritis Replacement Therapy

ROI- Region of Interest

SERM- Selective Estrogen Reuptake Modulators

SHO- Senior House Officer

SOS- Speed of Sound

SSRI- Selective Serotonin Receptor Inibitor

TCA- Tricyclic Antidepressant

TSH- Thyroid Stimulating Hormone

UCR- Ultrasound Critical angle Reflectometry

UK- United Kingdom

USA- United States of America

VFA- Vertebral Fracture Assessment

VQCT- Volumetric Quantitative Computed Tomography

WHO- World Health Organization

Abstract

Osteoporosis is the most common physiological disorder among the people in Bangladesh and worldwide. The main objective of this study was to find out the level of knowledge, the presence of risk factors, the habitual patterns regarding osteoporosis screening among mass students in different universities of Bangladesh. In this study, data was collected from 200 university students. Majority of them was graduate and other continuing their study, about 48% of them had no knowledge about osteoporosis, even they did not hear the name of that and 52% heard the term but lack of proper definition. This may be due to their ignorance in health knowledge. Moreover, 33% has family history, 28% has maternal history about osteoporosis. Those who know about osteoporosis they do not have any correct knowledge about the treatment and diagnosis procedure. A portion of them mentioned about few risk factors, that includes both controllable and uncontrollable risk factors. But some of were unaware of the disorders that affect the skeleton and only 24% are concerned about getting osteoporosis. Majority of people never (74%) discuss about Osteoporosis with their family and doctors, some do rarely or sometimes. Even with the doctors most of them never discuss, 30% do rarely, 18% do sometimes and only 8% of people do regular discussion about osteoporosis. Overall findings suggest that the knowledge about risk factors and protective factors and treatment among mass people concerning osteoporosis was relatively poor and needs to be improved. So, some steps should be taken by the authority with the help of professionals to make them aware of this physiological disorder.

CHAPTER 1

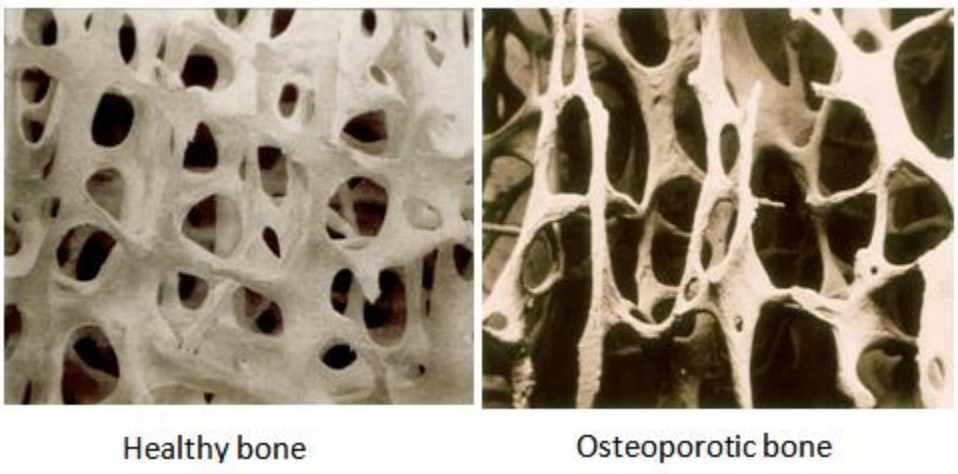
INTRODUCTION

1. Introduction

1.1 Overview

Osteoporosis is a condition that weakens bones, making them fragile and more likely to break. It is typically considered a "woman's disease," but 2 million of those with the disease are men. In fact, about 30 percent of hip fractures occur in men, and one in eight men over 50 years of age will experience an osteoporotic fracture (Ucsfhealth.org, 2016).

Osteoporosis is one of the major problems facing women and older people of both sexes. The morbid event in osteoporosis is fracture. However, the definition of osteoporosis should not require the presence of fractures but only a decrease in bone mass that is associated with an unacceptably high risk of fracture (Riggs and Melton, 1995). Wrist fractures, hip fractures and fractures of the vertebrae (bones in the spine) are the most common type of breaks that affect people with osteoporosis. However, they can also occur in other bones, such as in the arm, ribs or pelvis. There are usually no warnings to developed osteoporosis and it's often only diagnosed when a bone is fractured after even minor falls (Nhs.uk, 2016).



1.1 Figure: Osteoporosis (Den Uyl et al., 2011)

Currently there is no accurate measure of overall bone strength. Bone mineral density (BMD) is frequently used as a proxy measure and accounts for approximately 70 percent of bone strength. The World Health Organization (WHO) operationally defines osteoporosis as bone density 2.5 standard deviations below the mean for young white adult women. It is not clear how to apply this diagnostic criterion to men, children, and across ethnic groups. Because of the difficulty in accurate measurement and standardization

between instruments and sites, controversy exists among experts regarding the continued use of this diagnostic criterion (NIH, 2000).

Today, much more about diagnosing, preventing and treating osteoporosis as well as the condition's resulting complications are discovered. In addition to estrogen, other medications are available to control the disease. New medications and other treatments have changed the way we look at osteoporosis, the bone degeneration usually associated with the aging process. Osteoporosis affects an estimated 10 million people and almost 34 million have low bone mass, putting them at increased risk for developing osteoporosis (Ucsfhealth.org, 2016) (NIH, 2000)

1.2 Epidemiologic Study

On the Prevalence of Osteoporosis in Italy showed that the prevalence of osteoporosis among women and men aged 60 yr and over is 22.8% and 14.5%, respectively, giving rise to about 80,000 new fractures a yr. Sarcopenia is considered to be one of the main features of the aging process. It is characterized by a reduction in muscle mass and muscle strength, and affects women more than men. It is associated with an increased risk of fractures consequent upon a greater predisposition to falls, but also to the lack of bone remodeling due to reduced muscle mechanical strength. Muscle strength determines quality bone modifications such as density, strength, and microarchitecture. Variations in the ratios of cortical and muscle areas give rise to various types of osteoporosis, with different risks of fracture. Bone mineral density increases with body fat mass, and obesity has a protective effect against osteoporosis. This protective effect is explained by a combination of hormonal (peripheral aromatization of androgens to estrogens in adipose tissue) and mechanical factors (on weight-bearing bone sites), but the hormone leptin also probably mediates fat and bone mass. Serum leptin levels are closely related to body fat mass, and some findings suggest the peripheral effect of leptin, which exerts estrogenic effects, enhancing osteoblastic differentiation and inhibiting late adipocytic differentiation. The overall effect of leptin on bone results from a balance between negative central effects and positive direct peripheral effects, according to serum leptin levels (Crepaldi G. *et al*., 2006).

In the USA, approximately 1.5 million fractures annually are attributable to osteoporosis: these include 700,000 vertebral fractures, 250,000 distal forearm (Colles') fractures, 250,000 hip fractures, and 300,000 fractures of other limb sites. The lifetime risk of fractures of the spine (symptomatic), hip, and distal radius is 40% for white women and

13% for white men from 50 years of age onwards. Following a hip fracture, there is 10%–20% mortality over the subsequent 6 months, 50% of sufferers will be unable to walk without assistance, and 25% will require long-term domiciliary care. Contrary to prevailing opinion, the morbidity and suffering associated with wrist and spine fractures are also considerable. The annual cost of osteoporosis to the US healthcare system is at least $5–$10 billion with similar incidence and cost in other developed countries. These already high costs will increase further with continued aging of the population. In addition, the population explosion in underdeveloped countries will change the demography of osteoporosis; for example, the incidence of hip fracture, and, presumably, other osteoporotic fractures will increase fourfold worldwide during the next 50 years and the attendant costs will threaten the viability of the healthcare systems of many countries. Unless decisive steps for preventive intervention are taken now, a catastrophic global epidemic of osteoporosis seems inevitable (Riggs and Melton, 1995).

It's a fairly common condition that affects around three million people in the UK. More than 300,000 people receive hospital treatment for fragility fractures (fractures that occur from standing height or less) every year as a result of osteoporosis (Nhs.uk, 2016).

1.3 Types of osteoporosis

There are two types of osteoporosis: primary and secondary. Primary osteoporosis is usually related to aging or an unknown cause. Secondary osteoporosis can be caused by a variety of factors, including alcohol abuse, smoking, certain diseases, or certain medications. Both types of osteoporosis are treatable and can occur in both men and women (Clinaero I, 2016)

Primary osteoporosis is the more common form and is due to the typical age-related loss of bone from skeleton. It is classified as type 1 and type 2. Secondary osteoporosis results from the presence of other diseases or conditions that predispose to bone loss and is classified as type 3.

1.3.1 Type 1 Osteoporosis

Type 1 or postmenopausal osteoporosis occurs in 5% to 20% of women, affecting those within 15 to 20 years of menopause, with a peak incidence in the 60s and early 70s. The incidence in women is eight times higher than that in men. The frequency of

postmenopausal osteoporosis accounts for the overall female-male ratio of 2:1 to 3:1. (Medscape, 2016).

Estrogen deficiency is thought to underlie this form of osteoporosis, rendering the skeleton more sensitive to parathyroid hormone (PTH), resulting in increased calcium resorption from bone. This in turn decreases PTH secretion, 1,25-dihydroxyvitamin D production, and calcium absorption and ultimately causes loss of trabecular bone, leading to vertebral crush fractures and Colles' fractures. (Medscape, 2016).

Women can lose around 2% to 3% of their bone per year for the first 5 years after menopause. Because of the drop in estrogen production, women lose nearly 50% of their trabecular bone and 35% of their cortical bone throughout their lifetime, whereas men lose only 25% of both types of bone. At least 75% of the bone loss that occurs in women during the first two decades after menopause can be attributed to lack of estrogen rather than to aging. Bone loss associated with menopause does not begin with the onset of amenorrhea but may occur 1 to 3 years before the actual cessation of menstrual periods. (Medscape, 2016).

1.3.2 Type 2 Osteoporosis

Type 2 or senile osteoporosis occurs in women or men more than 70 years of age and usually is associated with decreased bone formation along with decreased ability of the kidney to produce $1,25(OH)_2D_3$. The vitamin D deficiency results in decreased calcium absorption, which increases the PTH level and therefore bone resorption. In type 2 osteoporosis, cortical and trabecular bone is lost, primarily leading to increased risk of hip, long bone, and vertebral fractures. (Medscape, 2016).

1.3.3 Type 3 Osteoporosis

Type 3 or secondary osteoporosis occurs equally in men and women and at any age. In men, most cases are due to disease or to drug therapy, but in 30% to 45% of affected individuals no cause can be identified. In various series of osteoporotic patients, secondary osteoporosis accounts for about 40% of the total number of osteoporotic fractures seen by a physician. This type of osteoporosis is associated with a variety of conditions, including hormonal imbalances (eg, Cushing's syndrome); cancer (notably multiple myeloma); gastrointestinal disorders (especially inflammatory bowel disease causing malabsorption); drug use (eg, corticosteroids, cancer chemotherapy, anticonvulsants, heparin, barbiturates,

valporic acid, gonadotropin-releasing hormone [GnRH], excessive use of aluminum-containing antacids); chronic renal failure; hyperthyroidism; hypogonadism in men; immobilization; osteogenesis imperfecta and related disorders; inflammatory arthritis (particularly rheumatoid arthritis); and poor nutrition (including malnutrition due to eating disorders). (Medscape, 2016)

1.3.4 Osteogenesis imperfecta

Osteogenesis imperfecta is a rare form of osteoporosis that is present at birth. Osteogenesis imperfecta causes bones to break for no apparent reason. (WebMD, 2016).

1.3.5 Idiopathic juvenile osteoporosis

Idiopathic juvenile osteoporosis is rare. It occurs in children between the ages of 8 and 14 or during times of rapid growth. There is no known cause for this type of osteoporosis, in which there is too little bone formation or excessive bone loss. This condition increases the risk of fractures (WebMD, 2016).

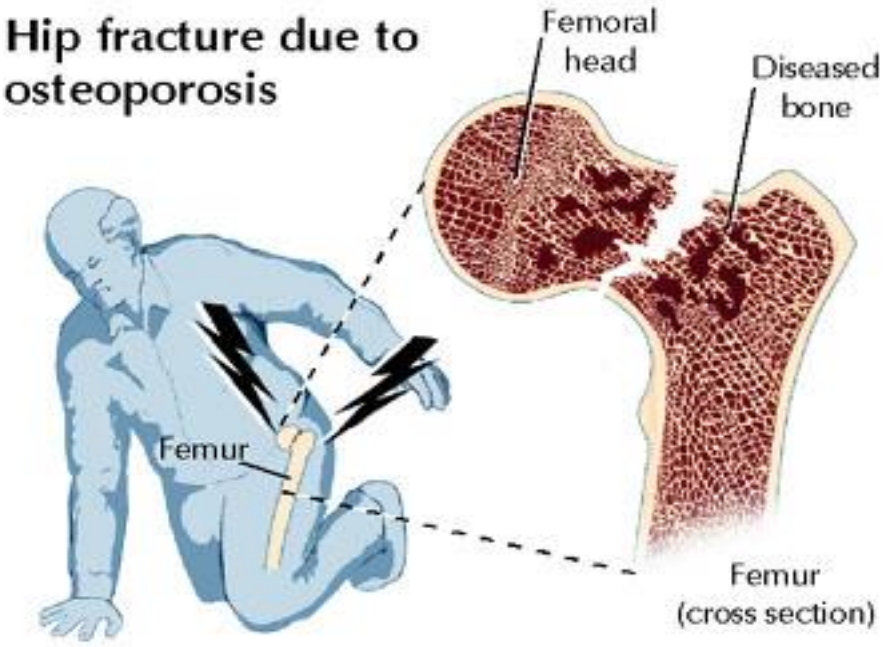
1.4 Pathophysiology

Peak bone mass is determined largely by genetic factors, with contributions from nutrition, endocrine status, physical activity and health during growth. Bone mass in older adults equals the peak bone mass achieved by age 18-25 years minus the amount of bone subsequently lost. The process of bone remodeling that maintains a healthy skeleton may be considered a preventive maintenance program, continually removing older bone and replacing it with new bone. Bone loss occurs when this balance is altered, resulting in greater bone removal than replacement. The imbalance occurs with menopause and advancing age. With the onset of menopause, the rate of bone remodeling increases, magnifying the impact of the remodeling imbalance. The loss of bone tissue leads to disordered skeletal architecture and an increase in fracture risk. Individual trabecular plates of bone are lost, leaving an architecturally weakened structure with significantly reduced mass. Increasing evidence suggests that rapid bone remodeling (as measured by biochemical markers of bone resorption or formation) increases bone fragility and fracture risk. Bone loss leads to an increased risk of fracture that is magnified by other aging-associated declines in functioning. These include general factors that relate to aging and sex steroid deficiency, as well as specific risk factors, such as use of glucocorticoids, which cause bone loss, reduced bone quality and disruption of micro architectural integrity.

Fractures result when weakened bone is overloaded, often by falls or certain activities of daily living (National Osteoporosis Foundation, 2010).

1.5 Signs and Symptoms

Osteoporosis means "porous bones." If you have osteoporosis, your bones don't look any different, but they lose substance as well as calcium and other minerals. As a result, your bones have less strength and are more likely to fracture, particularly if you fall. (Ucsfhealth.org, 2016)



1.5 Figure: Hip fracture due to osteoporosis (Dolan et al., 2006)

The most common osteoporosis fractures resulting from falls are in your wrist or hip. You are much more likely to have compression fractures in your vertebrae, the bones in your spine. A compression fracture is the result of the weakened bone cracking from the normal pressure of being upright. This often results in the curvature of the spine at the shoulders in older people sometimes called a "widow's hump." (Ucsfhealth.org, 2016)

The appearance of a widow's hump or a fractured wrist or hip from a fall may be the first actual symptoms of osteoporosis unless your doctor has been measuring your bone density. Men also should watch for a loss of height, change in posture or sudden back pain. There are a number of risk factors that increase a person's likelihood of having osteoporosis. (Ucsfhealth.org, 2016)

1.6 Risk factor

1.6.1 Risk Factors for Women

- European or American ethnic background
- Personal history of fracture as an adult
- Poor general health
- Smoking tobacco
- Low body weight, less than 127 pounds
- Estrogen deficiency
- Early menopause, before age 45
- Surgical removal of the ovaries before age 45
- Prior to menopause, having a time in your life when you went more than a year without a menstrual period
- Taking medical therapy that lowers estrogen levels, such as for breast cancer or endometriosis
- Lifelong low calcium intake
- Alcoholism
- Poor vision despite correction, like wearing glasses
- Falling
- Inadequate physical activity(Ucsfhealth.org, 2016)

1.6.2 Risk Factors for Men

- Heredity
- Race -- White men appear to be at the greatest risk for developing osteoporosis, although the condition can affect people of all ethnic groups
- Undiagnosed low levels of testosterone
- Falling

- Inadequate physical activity
- Age -- Bone loss increases with age
- Chronic disease that alters hormone levels and affects the kidneys, lungs, stomach and intestines
- Smoking tobacco
- Alcoholism
- Lifelong low calcium intake
- Low body weight

In addition, having a history of one of the following diseases can increase both a woman and man's risk of developing osteoporosis:

- Hyperparathyroidism, having an overactive parathyroid gland
- Hyperthyroidism, having an overactive thyroid gland
- Severe liver disease
- Kidney failure
- Pituitary tumor
- Adrenal disease
- Malabsorption
- Multiple sclerosis
- Rheumatoid arthritis
- Multiple myeloma
- Lymphoma
- Leukemia
- Diabetes

Taking one of the following medications can increase one's risk as well:

- Seizure medication

- Immunosuppressive drugs
- Steroids (prednisone, hydrocortisone, dexamethasone)
- Heparin
- Lithium
- Excess Thyroxine, thyroid replacement (Ucsfhealth.org, 2016)

1.7 Four key risk factors for fracture

After reviewing the literature and considering the effect of potential confounders, 4 key factors as predictors of fracture related to osteoporosis were identified: low BMD, prior fragility fracture, age and family history of osteoporosis. Other factors that are commonly cited — weight < 57 kg, weight loss since age 25, high caffeine intake and low calcium intake were not found to be consistent independent predictors of fracture risk, after taking into consideration age and/or BMD. (Jacques P. B. and Robert G. J., 2002).

1.7.1 Bone mineral density

The relation between BMD and fracture risk has been calculated in a large number of studies. A meta-analysis by Marshall and colleagues of some of the earlier studies probably still represents the best estimate. BMD is clearly the most readily quantifiable predictor of fracture risk for those who have not yet suffered a fragility fracture. For each standard deviation of BMD below a baseline level (either mean peak bone mass or mean for the reference population of the person's age and sex), the fracture risk approximately doubles. This risk should always be viewed in the context of the person's age. A 25 year old with a low BMD (e.g., a T-score of –2.5) has a very low 10-year risk of fracture that is not appreciably greater than that of a 25 year old with a high BMD. However, a person with the same BMD at age 65 has a much higher 10-year risk of fracture. What are the risk factors for low BMD? Or, for practical purposes, who should be selected for BMD measurements? This is a question with major economic implications. (Jacques P. B. and Robert G. J., 2002).

1.7.2 Prior fragility fracture

A prior fragility fracture places a person at increased risk for another one. The increased risk is 1.5- to 9.5-fold depending on age at assessment, number of prior fractures and the

site of the incident fracture. Vertebral fractures have been best studied in this regard. The presence of a vertebral fracture increases the

Risk of a second vertebral fracture at least 4-fold. A study of the placebo group in a recent major clinical trial showed that 20% of those who experienced a vertebral fracture during the period of observation had a second vertebral fracture within 1 year. Vertebral fractures are also indicators of increased risk of fragility fractures at other sites, such as the hip.38 In a clinical trial of risedronate, the combination of a vertebral fracture and low bone density was associated with a doubling of the 3-year risk of hip fracture (from 3% to 6%) in women over the age of 70. Similarly, wrist fractures predict vertebral and hip fractures. Patients with a hip fracture are at increased risk of a second hip fracture. Pooling the results from all studies (women and men) and for all fracture sites, the risk of subsequent fracture among those with a prior fracture at any site is 2.2 times that of people without a prior fragility fracture (95% confidence interval [CI] 1.9–2.6). (Jacques P. B. and Robert G. J., 2002).

1.7.3 Age

Age is clearly a major contributor to fracture risk. As summarized in a recent review by Kanis and others, the 10-year probability of experiencing a fracture of forearm, humerus, spine or hip increases as much as 8-fold between ages 45 and 85 for women and 5-fold for men. It is abundantly clear from epidemiology studies that age is a major risk factor for fracture. Because low BMD is also a major risk factor for fracture and BMD decreases with age, there must also be an age at which it is worthwhile to begin using BMD as a screening tool. The OSC has taken the position that BMD testing is appropriate for targeted case-finding among people under age 65 and for all women age 65 and older because of the high risk of osteoporosis and fracture after that age. (Jacques P. B. and Robert G. J., 2002).

1.7.4 Family history of osteoporotic fracture

This factor has been best studied with respect to hip fracture. The Study of Osteoporotic Fractures, for example, identified a maternal history of hip fracture as a key risk factor for hip fracture in a population of elderly women. A history of hip fracture in a maternal grandmother also carries an increased risk of hip fracture. Although most studies have focused on the index person's mother or other female family members, genetic influence on risk of osteoporosis is multifactorial, and one should not ignore a history of osteoporotic fracture in first- or second degree male relatives. The emphasis on the presence of osteoporotic fractures in patients' female relatives in epidemiology studies probably

reflects the belief that osteoporosis is mostly a disease of women. It is now clear that osteoporosis is common in men; therefore, although the recommendations focus on hip fractures in a patient's mother or grandmother, other family members should be included during assessment of genetic contribution to osteoporosis risk. Genetic influence on osteoporosis and BMD is extremely important; it has been estimated that heredity accounts for 50–80% of the variability in BMD. Genetic influences on bone have been the subject of major scientific investigations, and a number of genes have been associated with osteoporosis. However, these discoveries have not yet resulted in a clinical application in the diagnosis and treatment of osteoporosis at the practitioner level. (Jacques P. B. and Robert G. J., 2002)

1.8 Common Causes of Secondary Osteoporosis

Because these causes of secondary osteoporosis are so common, it's worth taking an in-depth look at them.

1.8.1 Glucocorticoid Medications

Glucocorticoids are steroid medications used to treat diseases such as asthma and rheumatoid arthritis. Bone loss is a common side effect of these medications. The bone loss these medications cause may be due to their direct effect on bone, muscle weakness or immobility, reduced intestinal absorption of calcium, a decrease in testosterone levels, or, most likely, a combination of these factors. (Clinaero I., 2016)

When glucocorticoid medications are used on an ongoing basis, bone mass often decreases quickly and continuously, with most of the bone loss occurring in the ribs and vertebrae. Therefore, people taking these medications should talk to their doctor about having a bone mineral density (BMD) test. Men should also be tested to monitor testosterone levels, as glucocorticoids often reduce testosterone in the blood.

A treatment plan to minimize bone loss during long-term glucocorticoid therapy may include using the minimum effective dose, discontinuing the drug, or administering it through the skin, if possible. Adequate calcium and vitamin D intake is important, as these nutrients help reduce the impact of glucocorticoids on the bones. Other possible treatments include testosterone replacement therapy and osteoporosis medication. Alendronate and risedronate are two bisphosphonate medications approved by the U.S. Food and Drug Administration (FDA) for use by men and women with glucocorticoid-induced osteoporosis. (Albrecht *et. al.*, 2006).

1.8.2 Hypogonadism

Hypogonadism refers to abnormally low levels of sex hormones. It is well known that loss of estrogen causes osteoporosis in women. In men, reduced levels of sex hormones may also cause osteoporosis.

While it is natural for testosterone levels to decrease with age, there should not be a sudden drop in this hormone that is comparable to the drop in estrogen experienced by women at menopause. However, medications like glucocorticoids, cancer treatments (especially for prostate cancer), and many other factors can affect testosterone levels. Testosterone replacement therapy may be helpful in preventing or slowing bone loss. Its success depends on factors such as age and how long testosterone levels have been reduced. Also, it is not yet clear how long any beneficial effect of testosterone replacement will last. Therefore, doctors usually treat the osteoporosis directly, using medications approved for this purpose. (Clinaero I., 2016)

Recent research suggests that estrogen deficiency may also be a cause of osteoporosis in men. For example, estrogen levels are low in men with hypogonadism and may play a role in bone loss. Osteoporosis has been found in some men who have rare disorders involving estrogen. Therefore, the role of estrogen in men is under active investigation. (Albrecht *et. al.*, 2006).

1.8.3 Alcohol Abuse

There is a wealth of evidence showing that alcohol abuse may decrease bone density and lead to an increase in fractures. In cases where bone loss is linked to alcohol abuse, the first goal of treatment is to help the patient stop -- or at least reduce -- his or her consumption of alcohol.

More research is needed to determine whether bone lost to alcohol abuse will rebuild once drinking stops, or even whether further damage will be prevented. It is clear, though, that alcohol abuse causes many other health and social problems, so quitting is ideal. A treatment plan may also include a balanced diet with lots of calcium- and vitamin D-rich foods, a program of physical exercise, and smoking cessation. (Albrecht *et. al.*, 2006).

1.8.4 Smoking

Bone loss is more rapid, and rates of hip and vertebral fractures are higher, among people who smoke, although more research is needed to determine exactly how smoking damages bone. Tobacco, nicotine, and other chemicals found in cigarettes may be directly toxic to bone, or they may inhibit absorption of calcium and other nutrients needed for bone health.

Quitting is the ideal approach, as smoking is harmful in so many ways. As with alcohol, it is not known whether quitting smoking leads to reduced rates of bone loss or to a gain in bone mass. (Clinaero I., 2016)

1.8.5 Gastrointestinal Disorders

Several nutrients -- amino acids, calcium, magnesium, phosphorous, and vitamins D and K are important for bone health. Diseases of the stomach and intestines can lead to bone disease when they impair absorption of these nutrients. In such cases, treatment for bone loss may include taking supplements to replenish these nutrients. (Clinaero I., 2016)

1.8.6 Hypercalciuria

Hypercalciuria is a disorder that causes too much calcium to be lost through the urine, which makes the calcium unavailable for building bone. Patients with hypercalciuria should talk to their doctor about having a BMD test and, if **bone density** is low, discuss treatment options. (Albrecht *et. al.,* 2006).

1.8.7 Immobilization

Weight-bearing exercise is essential for maintaining **healthy bones**. Without it, bone density may decline rapidly. Prolonged bed rest (following fractures, surgery, spinal cord injuries, or illness) or immobilization of some part of the body often results in significant bone loss. It is crucial to resume weight-bearing exercise (such as walking, jogging, dancing, and lifting weights) as soon as possible after a period of prolonged bed rest. If this is not possible, you should work with your doctor to minimize other risk factors for osteoporosis (Clinaero I., 2016)

1.8.8 Drug induced osteoporosis

Bone Mineral Density Loss and Fractures Associated with Oral Glucocorticoid Use Long-term administration of GCs induces a rapid loss of bone mass of between 5 and 15% annually. Histomorphometric as well as densitometric studies have shown that G Cinduced

bone loss is most pronounced during the first 3–12 months of therapy, but continues as long as treatment is maintained. The demineralization is more pronounced in trabecular than in cortical bone compartments and not all regions of the skeleton are affected alike. In a study, after 20 weeks of treatment with prednisone (mean daily dose of 7.5 mg) the average loss of bone density in the lumbar spine was 8% in heart transplant patients. In a longitudinal histomorphometric study of the treatment with prednisone (10– 25 mg) over 5–7 months resulted in a reduction of 27% of the trabecular bone volume in the crista iliaca. Not all patients treated with GCs are similarly affected. Differences are possibly genetically determined and could be related to variants of the steroid receptor and individual pharmacokinetic differences. The response of bone formation markers to GCs can be predicted by the urinary measure of this enzyme, a recent finding which may contribute to the identification of individuals at highest risk of developing GIOP. Total bone mineral loss correlates directly with the cumulatively given steroid dose. Although 7.5 mg of prednisone equivalent a day was considered to be the threshold dose for skeletal side effects, recently published data have shown that lower doses and even inhaled GCs may induce skeletal side effects. In children under low-dose inhaled steroids even impaired growth has been demonstrated. In adults under high-dose inhaled GCs, a dose dependent reduction of bone density has been observed and the cumulative dose of inhaled corticosteroids in adult asthmatics was shown to correlate negatively with bone density. (Albrecht *et. al.*, 2006)

1.8.9 Bone Mineral Density Loss Associated with Inhaled Glucocorticoids

Inhaled high-potency glucocorticoids used to treat asthma and chronic obstructive airways disease have been shown to cause bone loss when used over an extended time period. A cross-sectional study showed that cumulative exposure to 5,000 mg of beclomethasone (2,000 mcg/day for seven years) was associated with enough loss of bone 13 mineral density to double fracture risk. One three-year longitudinal study of inhaled triamcinolone therapy in chronic obstructive pulmonary disease showed significant bone loss compared to those treated with a placebo inhaler. No studies documenting or suggesting increased rates of fracture attributable to inhaled or nasal glucocorticoids have been done (Florence et. al., 2013).

1.8.10 Hormonal Therapies

Estrogen and testosterone are important regulators of the bone remodeling process, so it is not surprising that osteoporosis is associated with a decline in hormonal concentrations

after menopause. Similarly, testosterone deficiency is the most common cause of osteoporosis in men, although the role of testosterone is not as straight forward as once thought. Drugs inhibiting secretion or altering the metabolism of sex hormones have the potential to induce osteoporosis. These drugs include the aromatase inhibitors (AIs) and gonadotropin releasing hormone (GnRH) agonists used in the treatment of breast and prostate cancers, as well as the contraceptive depot medroxyprogesterone acetate (DMPA). Thyroid hormones also affect bone metabolism, with increased bone resorption observed in hyperthyroidism. The bone effects result from both endogenous and exogenous causes of hyperthyroidism. (Susann et. al., 2010).

1.8.11 Aromatase Inhibitors

The use of AIs as adjuvant treatment for breast cancer has been shown to improve disease free survival and decrease the occurrence of metastatic disease in post- menopausal women with estrogen receptor–positive disease. However, the pharmacologic activity of these agents also affects BMD and fracture risk. After menopause, estrogen is produced in the peripheral tissues by the conversion of adrenal androgens to estrogen. The AIs inhibit the aromatase enzyme, responsible for this conversion, and result in decreased estrogen concentrations. Because many postmenopausal women have several underlying risk factors for osteoporosis, further estrogen loss from treatment with AIs might be expected to cause bone loss and increased fracture risk (Susann et. al., 2010).

1.8.12 Depot Medroxyprogesterone Acetate

Current drug use patterns indicate that DMPA is the contraceptive of choice for more than 2 million women, including some 400,000 adolescents. This agent prevents pregnancy by inhibiting LH and FSH, causing an ovulation and a corresponding decrease in estrogen production. The potential loss of bone owing to DMPA-related estrogen deprivation is of particular concern for teenage girls and women younger than 30, a time when BMD normally increases. Prolonged use could potentially decrease the peak bone mass and increase the risk of fragility fractures in 20–30 years. (Susann et. al., 2010)

1.8.13 GnRH Agonists

These agents are sometimes used in combination with AIs or tamoxifen. The GnRH agonists down-regulate the secretion of luteinizing hormone (LH) and follicle stimulating hormone (FSH), resulting in suppression of ovarian function and a corresponding decline

in estrogen production. Suppression of ovarian function by GnRH agonists is a treatment strategy also employed in the management of endometriosis. Regardless of the indication for ovarian suppression, bone metabolism is likely to be affected and result in bone loss. (Susann et. al., 2010).

1.8.14 Thyroid Replacement Therapy

Hyperthyroidism and thyroid replacement therapy are both associated with bone loss. Thyroid-stimulating hormone (TSH) receptors have been identified on osteoclastic and osteoblastic precursor cells with accelerated bone resorption occurring during hyperthyroid states when TSH concentrations are suppressed. Over supplementation of thyroid replacement hormone causes an exogenous hyperthyroidism, suppressing TSH concentration, with direct effects on bone remodeling that result in bone loss (Susann et. al., 2010).

1.8.15 Central Nervous System Agents

Several classes of central nervous system agents have been associated with an increased risk of fracture. These include anticonvulsants, antidepressants, and antipsychotics.

- **Antidepressants**

The serotoninergic system appears to play an important role in bone physiology, which has implications for the effect of selective serotonin reuptake inhibitors (SSRIs) and serotoninergic tricyclic antidepressants (TCAs) on bone health. Specifically, serotonin appears to modulate skeletal response to parathyroid hormone, possibly through receptors and transporters found on osteoblasts and osteocytes. Several studies have shown bone loss among SSRI users, suggesting a clinical effect on bone metabolism.The association between antidepressant use and fractures is well established; however, recent evidence suggests that depression itself is associated with decreased BMD and increased fracture risk. In addition to drugs, behavioral and biologic factors can interact in an individual to negatively affect bone health. (Susann et. al., 2010).

- **Anticonvulsants**

There are several mechanisms by which anticonvulsants might affect bone metabolism. Initially, it was thought that the anticonvulsants that are potent inducers of cytochrome P450 (CYP) (i.e., carbamazepine, phenobarbital, and phenytoin) might increase the metabolism of vitamin D, leading to a reduction in calcium absorption, subsequent

elevation in parathyroid hormone, and increased bone turnover. It has also been suggested that CYP induction leads to lower circulating concentrations of estrogen and testosterone, resulting in bone loss. However, many anticonvulsants that do not affect CYP metabolism are associated with bone loss, indicating that other mechanisms are likely responsible. However, these other mechanisms are poorly understood. Early data in animals suggested that anticonvulsants directly inhibit intestinal calcium absorption. More recently, in vitro studies suggested that anticonvulsants directly inhibit osteoblasts, resulting in decreased bone formation. (Susann et. al., 2010).

- **Antipsychotic Agents**

Similar to antidepressants, a well-established relationship exists between antipsychotic agents and falls and fracture. The postulated biologic mechanism by which antipsychotic agents affect bone physiology is related to their effect on prolactin concentrations. Conventional antipsychotics, in particular, are known to cause a rise in prolactin 16 concentration; this in turn lowers estrogen and testosterone concentrations, potentially leading to bone loss. As with depression, other mental illnesses might also represent an independent risk factor for osteoporosis. Schizophrenia and other psychotic disorders were).

1.8.16 Gastric Acid–Reducing Agents

- **H2-Receptor Antagonists**

In contrast to PPIs, data on H2RA use were equivocal; one study found these agents to have a protective effect on BMD, whereas another showed a significant association between hip fracture and H2RA use, although this association was not as strong as that observed with PPIs. Although epidemiologic data alone are insufficient to prove a causal relationship between gastric acid–reducing agents (particularly PPIs) and an increase in osteoporotic fracture, gastric acid reducers may contribute to overall risk when assessing bone health in patients using these agents. (Susann et. al., 2010)

- **Proton Pump Inhibitors**

Interest in the association between proton pump inhibitor (PPI) use and hip fracture arose from studies that showed decreased calcium absorption in patients taking PPIs. Less potent gastric acid agents, the H2-receptor antagonists (H2RAs), were not observed to have the same effect. However, the studies varied in method and may not have used correct testing to document these potential drug-drug or drug-food interactions. Other data suggest that

PPIs have a direct effect on bone metabolism. Proton pumps have been identified on osteoclasts and appear to be used during the excretion of hydrogen ions for bone resorption. Inhibition of these proton pumps may interfere with the resorption process, resulting in decreased bone density with time. Proton pump inhibitors appear to affect BMD in men; a small but significant difference in hip BMD was observed among male PPI users compared with non-users. However, similar observations were not found in women, suggesting that men are at somewhat increased risk compared with women. (Susann et. al., 2010).

- **Thiazolidinediones**

The risk of fracture appears to be increased in individuals with type 2 diabetes, with some suggestion that good glucose control reduces the association between the disease and fracture risk. However, there is an apparent increased risk of fracture associated with the 17 thiazolidinediones rosiglitazone and pioglitazone; this was first identified in randomized controlled trials examining the efficacy of these agents in the management of type 2 diabetes. However, when stratified by sex, the ARI was significantly increased for women at 2.8% compared with no difference in risk for men. In fact, men using thiazolidinedione experienced fewer fractures than the control group of either metformin or sulfonylurea users. Most fractures were observed in the periphery rather than the hip or spine, but this may simply be a reflection of the younger patient sample in the randomized controlled trials (average age 50–60 years) (Susann et. al., 2010).

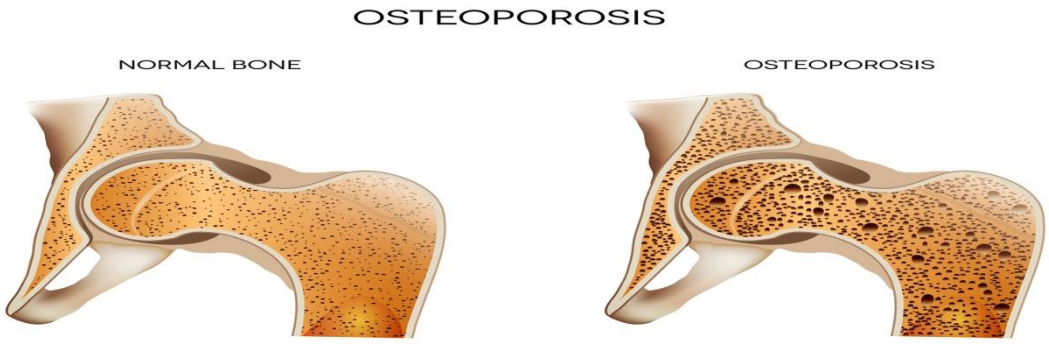
1.9 The diagnosis of osteoporosis

The single best predictor of bone strength is bone density. Bone density cannot be determined from plain X-rays, but a specialized low-dose X-ray technique called bone densitometry can be used to measure the amount of bone present in different parts of the skeleton. Research over the past decade has shown conclusively that bone density is related to risk of fracture, in much the same way that blood cholesterol is related to the risk of heart disease. The lower the bone density, the greater the risk of fractures due to osteoporosis. (Houge et. al., 2010).

1.9.1 Types of Bone Density Tests

A variety of techniques to diagnose osteoporosis by determining the density of bones. Expert consultation is available to assist in ordering the appropriate diagnostic examination. The different scanning techniques are:

- **Dual X-ray absorptiometry (DXA)**of the lower (lumbar) spine and hip. This is the most common way to measure bone density. The DXA uses fan beam technology allowing for rapid scanning with very low-energy X-rays. The spine and hip exams each take about five minutes. DXA of the forearm also may be helpful, especially if both hips have been replaced surgically. The Hologic Delphi scanner at Mount Zion also can perform a low-dose X-ray to evaluate for spinal fractures. DXA tests are painless. You will be asked to change into a hospital gown to prevent any clothing or metal objects from interfering with the test. You will lie on a table and the scanning arm is moved slowly over the parts of the body to be scanned. You are not in a tunnel as with an MRI. The test takes about 10 to 15 minutes. (Houge et. al., 2010).



1.9 Figure: Difference between normal bone and osteoporosis bone. (Sugi et al., 2012)

- **Ultrasound** of the heel. Bone density of the heel predicts overall fracture risk. However, ultrasound of the heel is not as good at predicting hip and vertebral fractures as DXA of the hip and spine. There are some instances in which your doctor might select this exam instead of, or in addition to, a DXA. (Houge et. al., 2010).
- **Conventional radiography** is employed to detect the presence of vertebral and appendicular fractures. Conventional radiology of the spine, proximal hip and appendicular skeleton have also been used to detect low bone mass, but this is notoriously unreliable, since 30-40% of skeletal mass must be lost before osteopenia can be detected on routine radiographs. Moreover, some 25% of patients with apparent radiographic osteopenia (technical faults) or vertebral fracture (juvenile epiphysitis, trauma or even normal variations in vertebral body shape) have a normal BMD and may not be at increased risk of subsequent fractures (Houge et. al., 2010).

- **Quantitative computerized tomography (QCT)** of the lower (lumbar) spine. This exam uses a standard CT scanner. Two vertebrae in the lower back are selected for single cross-sectional scans, which are analyzed with special densitometry software. The entire procedure takes about 15 minutes. This exam sometimes is used if you have a lot of arthritis in your back, which makes the DXA test less reliable. This exam isn't always covered by insurance and isn't covered by Medicare. (Ucsfhealth.org, 2016).
- **Lateral radiographs** of the thoracic and lumbar spine. Using a conventional X-ray unit, views of the upper and lower spine are taken to see if you have any fractures. This is a 15-minute exam.

The recommended clinical examination consists of DXA of the spine and hip. QCT and lateral radiographs of the spine may be needed depending on the DXA results and your particular circumstances (Ucsfhealth.org, 2016).

A number of new techniques, including three-dimensional volumetric quantitative CT (vQCT), micro-CT (μCT), high resolution magnetic resonance imaging (HRMRI), microMRI (μMRI), and QCT-based finite element analysis (FEA), are currently being tested to assess structural bone properties, but are not yet available for clinical use (Houge et. al., 2010).

1.10 Treatment

Your bone density test will tell your doctor if your bone density is normal, osteopenic (low bone mass) or osteoporotic. Based on these results and your risk factors for fracture, you and your doctor may select among the following treatment options. (Aliya et. al., 2014).

1.10.1 Prevention: All men and women should optimize their lifestyle to help prevent bone loss. This includes:

- Adopting a regular exercise regimen of weight-bearing exercises, such as walking or jogging, dancing, weight lifting, racquet sports and using resistance machines.
- In addition, it is important to get enough vitamin D. A daily intake of 400 IU, but no more than 800 IU, each day is recommended. Obtaining adequate amounts of vitamin D from our food may be difficult. The main sources of dietary vitamin D are fortified milk (100 IU/cup), egg yolks (25 IU/yolk) and oily fish (vitamin D content varies). Sunlight exposure causes vitamin D production in the skin, but this

effect is blocked by sunscreen. Many people will need vitamin D supplements to achieve an adequate intake. Most multi-vitamins contain 400 IU of vitamin D.

- Ensuring a daily **calcium** intake of 1,000 mg per day to age 50, and 1,200 to 1,500 mg per day for those over age 65 also is recommended. Our Calcium Counter offers a basic guideline for maintaining good bone health through adequate calcium consumption. (Aliya et. al., 2014).

1.10.2 Treating Fractures: The most common osteoporotic fractures are in the wrist, spine and hip. Wrist and hip fractures may require casting, hospitalization or surgery depending on how the bone is broken. Vertebral fractures can be very painful and there are now some options to treat them.

1.10.3 Medication: There are many medications available. All have risks and benefits. Only doctor can select which medication is right for patient.

- **Estrogen**

The female hormone estrogen is very effective at preventing bone loss, especially around the time of menopause. It also can help regain bone mass in older women. Estrogen reduces hip and spine fractures by about 30 percent to 40 percent. There is a small increase in risk for breast cancer and vascular disease such as heart attacks and strokes. There also is a small risk of developing blood clots on estrogen therapy. The risks and benefits of estrogen therapy must be weighed carefully for each woman. (Heinz, 2000).

- **Bisphosphonates**

These medications are very effective in increasing bone mass at all ages and reduce fractures by about 40 percent to 50 percent (about 5 percent for men). Current bisphosphonates approved for osteoporosis include alendronate (Fosomax) and risidronate (Actonel). These medications can be hard to absorb and they must be taken on an empty stomach first thing in the morning with water only. You then must remain upright for at least 30 minutes before eating or drinking anything else. Rarely, these medications can cause esophageal irritation and ulceration. There are daily and weekly regimens of bisphosphonates; both appear equally effective at increasing bone density. (Aliya et. al., 2014).

Chemical modification	Generic Name	Antiresorptive potency
First generation		
Short alkyl	etidronate	1
Halide side chain	Clodronate	10
Second generation		
Amino-terminal	Tiludronate	10
	Pamidronate	100
	Aledronate	100-1000
Third generation		
Cyclic side chain	Risedronate	1000-10000
	Ibandronate	1000-10000
	Zoledronate	10000+

Table 1.11.3: Generations of bisphosphonates(Jaroslav, 2007)

- **Calcitionin**

This medication is a nasal spray and some evidence suggests it may reduce vertebral fractures although the studies are small. Unlike other medications, it appears to help reduce the pain associated with fractures. While calcitionin is currently only FDA approved for the treatment of osteoporosis in postmenopausal women, evidence suggests that it may have similar effects of men. (Aliya et. al., 2014).

- **Raloxifene (Evista)**

This medication acts like estrogen at some parts of the body (bone, heart) and opposes estrogen effects at other parts (breast, uterus). It reduces the risk of vertebral fractures by 40 percent. Similar to estrogen, it increases the risk of blood clots and can increase hot flashes if used around the time of menopause. It appears to reduce the risk of breast cancer in low-risk women by about 75 percent. It has not been tested for effects on hip fracture. (Aliya et. al., 2014).

- **Parathyroid Hormone (PTH)**

Teriparatide, a form of parathyroid hormone, has been shown to stimulate bone formation and increase bone mineral density. In postmenopausal women who took the drug, fracture reduction of 50 percent to 70 percent was seen in the spine, hip, foot, ribs and wrist. An 11-

month study conducted by E. Orwoll and the Oregon Health Science at the University of Portland, found that men with osteoporosis who took PTH had a spine bone mineral density (BMD) increase of 6 percent and a hip BMD increase of 1.5 percent. Teriparatide is self-administered as a daily injection for up to two years. (Aliya et. al., 2014).

- **Alendronate Alendronate**

taken orally, has been approved for the prevention of osteoporosis at a daily dose of 5 mg and for the treatment of osteoporosis at a daily dose of 10 mg or a weekly dose of 70 mg. Alendronate reduces the risk of vertebral fractures in postmenopausal woman with and without previous vertebral fractures. Alendronate use reduces bone resorption and improves BMD. (Aliya et. al., 2014).

- **Risedronate**

Maintains bone mass and preserves bone microarchitecture and it reduces the risk of vertebral and nonvertebral fractures. In the Vertebral Efficacy with Risedronate Therapy trials 5 mg of risedronate daily reduced the incidence of new fractures within 6 months of the start of therapy and significantly lowered the risk of new vertebral fractures within 1 year. The reduction in risk was maintained for up to 7 years of treatment. Elderly women at high risk, risedronate reduced the risk of nonvertebral fractures after 3 years of treatment and also reduced the risk of hip fractures. Studies involving earlypostmenopausal women demonstrated that 5 mg of risedronate daily increased the BMD at the lumbar spine by more than 5% during 2 years of treatment as compared with both baseline and placebo (Aliya et. al., 2014).

- **Fluoride**

It is still not clear whether treatment with sodium fluoride (NaF) is beneficial. It increases cancellous bone mass dramatically when combined with adequate calcium and vitamin D. theoretically, it may be useful in preventing vertebral crushing. However, it was not shown to reduce spinal fractures and it may actually increase fractures of the hip. Fluoride supplementation, in amounts above those in fluoridated water, contributes to higher bone density, but possibly of a lesser quality. It is currently not recommended as treatment and is still under investigation.

- **Thiazides**

In some people or in some conditions, excess calcium is lost in the urine. Calcium-sparing diuretics are given to prevent this loss. Whether thiazide therapy has a role in osteoporosis has not been determined. (Heinz, 2000)

Non-FDA-Approved Drugs for Osteoporosis: These drugs are listed for information only. These non-approved agents include:

- **Calcitriol**

This synthetic vitamin D analogue, which promotes calcium absorption, has been approved by the FDA for managing hypocalcemia and metabolic bone disease in renal dialysis patients. It is also approved for use in hypoparathyroidism, both surgical and idiopathic, and pseudohypoparathyroidism. No reliable data demonstrate a reduction of risk for osteoporotic fracture.

- **Strontium ranelate**

This medication is approved for the treatment of osteoporosis in some countries in Europe. Strontium ranelate reduces the risk of both spine and non-vertebral fractures, but the mechanism is unclear. Incorporation of strontium into the crystal structure replacing calcium may be part of its mechanism of effect

- **Tibolone**

It is a tissue-specific, estrogen-like agent that may prevent bone loss and reduce menopausal symptoms but it does not stimulate breast or uterine tissue. It is indicated in Europe for the treatment of vasomotor symptoms of menopause and for prevention of osteoporosis, but it is not approved for use in the US (National Osteoporosis Foundation, 2010).

Kyphoplasty: A new treatment for osteoporosis spine fractures is called kyphoplasty. Kyphoplasty is a minimally invasive procedure, which means only tiny incisions are used. Through an incision, a small balloon is inserted into the collapsed bone to restore its shape. It is then filled with a substance that hardens and helps the bone expand. Long-term trials of this procedure are ongoing. (National Osteoporosis Foundation, 2010).

1.11 Future trends in the treatment and prevention of osteoporosis and fractures

- **Nitrates**

Nitric oxide (NO) is produced by NO synthetases in all bone cells. NO mediates effects of strain (physical activity) and estrogen on bone and arteries. Clinically available nitrates (such as nitroglycerine) prevent bone loss in ovariectomized and corticosteroid treated mice.

- **Beta-blockers**

Beta-blockers increase osteoblast activity in experimental animals. Mice treated with propranolol have increased bone mass. However, the clinical use of beta-blockers in osteoporosis is uncertain.

- **Kathepsin K inhibitors**

Kathepsin K produces H+ thus acidifying the area under the osteoclast leading to an increase in dissolving bone mineral exposing the matrix for degradation by proteinase. The inhibitors of kathepsin K reduce the resorption of bone and enable the activity of osteoblasts (Jaroslav Blaho, 2007) (Ucsfhealth.org, 2016).

CHAPTER 2

LITERATURE REVIEW

2. Literature review:

2.1 Poor Knowledge about Osteoporosis in Learned Indian Women

In study let by Pande (2005) among Indian women found that the correct definition of osteoporosis was given by 74%, but there was general lack of awareness in all the areas assessed. There was statistically significant difference in the total score depending on the faculty of education, with staff members from the science faculty having the maximum mean score ($p < 0.05$). We found no influence of age, menopausal status, previous history of fracture and family history of osteoporosis on the level of knowledge. Media (74%) was the commonest source of knowledge followed by friends (49%) and doctors (25%). (Pande et al., 2005)

2.2 Knowledge, Beliefs, and Behaviors among College Women Concerning the Prevention of Osteoporosis

A survey was conducted by Kasper (1994) where one hundred twenty-seven midwestern state university. One hundred fourteen (90%) of the survey respondents had heard about osteoporosis, but only 49 (43%) of the 114 had received information from either a health care provider or a school. There was a significant relationship between receiving osteoporosis information and the ability to correctly identify risk factors (P\m=le\.006).Only 6.7% of the women reported getting both adequate "osteoprotective" exercise per week and the recommended 1200 mg of calcium per day. Respondents believed that it was unlikely that osteoporosis would develop in them. They also expressed less responsibility and concern about osteoporosis and believed that it is less serious than other common causes of morbidity and mortality in women, such as heart disease and breast cancer (P\m=le\.02).There was no significant relationship between risk-factor identification and exercise habits, calcium intake, or beliefs about osteoporosis. (Kasper, 1994)

2.3 Family history of osteoporosis and bone mineral density at the axial skeleton: The rancho bernardo study

A study were done by Saw (2003) to determine whether a family history of osteoporosis identifies individuals with low bone mineral density (BMD), we studied 1477 white elderly (aged 60–89 years), noninstitutionalized ambulatory men (n = 600) and women (n = 877) from the Rancho Bernardo, California cohort. Family history data on biologic parents and full sisters were obtained by questionnaire. BMD of the lumbar spine and hip was measured

using dual-energy x-ray absorptiometry. After adjustment for age, body mass index, history of cigarette smoking, thiazide use, and estrogen use, men and women with a family history of osteoporosis had lower BMD than those with a negative family history. In men, a positive family history was associated with lower BMD at the hip (p = 0.01), whereas in women a significant association was observed for the spine (p = 0.02). BMD decreased in a stepwise fashion with an increasing number of family members with a history of osteoporosis. Analysis of the effect of parental history of osteoporosis on BMD showed a significant relation between paternal (but not maternal) history and lumbar spine BMD in both sexes and a significant relation between maternal (but not paternal) history and hip BMD only in men. The relative risk of having categoric osteopenia was highest in those whose fathers had a history of osteoporosis (RR 2.16, 95% CI = 1.38–3.37). A similar association was found for subjects with fractures. These results were not explained by differential awareness of family history in individuals with known osteoporosis, because the prevalence of family history was unrelated to personal history of osteoporosis in men and only weakly related in women. The positive predictive value of family history as an indicator of categorically defined low bone density was 22% in men and 24% in women, although in women this value increased to 33% when father's history alone was considered. The negative predictive value of overall family history was 65% in men and 81% in women. Overall, these data suggest that clinicians who ask patients about family history of osteoporosis should ask about both parents. (Soroko et al., 2009)

2.4 Awareness and health beliefs of women towards osteoporosis

A population-based survey was conducted to determine the awareness, knowledge of risk factors, and attitudes toward osteoporosis in middle-aged and elderly women in Singapore. Chinese women aged 45 years and above (n=1,376) living in Teban Gardens (community on the western side of Singapore) were randomly sampled. Household interviews were conducted and questions on socioeconomic status, knowledge of osteoporosis, identification of risk factors for osteoporosis, and health beliefs were assessed. There were 946 (68.8%) women who were postmenopausal and 430 (31.2%) who were not. Fifty-eight percent of the sample had heard of osteoporosis. Women who were younger, better educated, who exercised regularly, or who were single were more likely to have heard of osteoporosis. The main sources of information about osteoporosis were the mass media and friends. The identification of risk factors ranged from fair to good: 85.7% of women identified low calcium intake, 43.7% identified lack of exercise, and 30.5% identified

family history of osteoporosis as risk factors for osteoporosis. Most women (79.1%) were concerned about developing osteoporosis but only 15.2% thought that osteoporosis was more serious than cancer. Community-based health education programs on osteoporosis that target a wide audience including the less well educated, could be implemented. Increasing the awareness of osteoporosis and its risk factors may be essential in efforts to decrease the incidence of this disease. (Saw et al., 2003)

2.5 A Prospective Evaluation of the Awareness, Knowledge, Risk Factors and Current Treatment of Osteoporosis in a Cohort of Elderly Subjects

A research were done by the scientists Juby and Davis, (2001) was a prospective cohort study of 145 seniors attending a senior's clinic and social day program using a self-administered questionnaire. Its objective was to evaluate the awareness, knowledge, risk factors and current treatment of osteoporosis in our two patient groups. A secondary objective was to determine differences between the two cohorts, and between men and women. Participants included 39 men and 106 women, with an average age of 76 years. Of these, 89% were aware of osteoporosis and 61% gave the correct definition. Awareness and accurate definition were less in men compared with women ($p<0.01$, and$p<0.05$) and clinic compared to day program groups ($p<0.01$). Only 54% of men knew osteoporosis could affect them. Television, newspapers and friends were identified as the main source of information. Physicians ranked as fifth as a source of information. In all, 84% knew diet was important. Prevalence of risk factors other than age were < 20%, except for senescence (38%) and alcohol use (40%). Utilization of specific therapies for osteoporosis was only 18% overall with a rate of 3% in men ($p<0.01$). In women, 50% and were taking calcium supplements compared with 15% men ($p<0.001$) and for multivitamins the figures were 57% and 33% respectively ($p<0.05$). These results show a high level of awareness and correct definition of osteoporosis in this cohort of patients. Specific therapy for prevention or treatment of osteoporosis was inappropriately low in the face of high risk. This study highlights the care gap in osteoporosis in seniors and the need for increased physician involvement in patient education and treatment. Proactive treatment requests from patients need to be encouraged, especially with the future demographic shift. (Juby and Davis, 2001)

2.6 Osteoporosis knowledge, beliefs, and practices among adolescent females

In 2005, Anderson had demonstrated female adolescents believed that physical inactivity, smoking, and inadequate calcium were health-risking behaviors and osteoporosis risk factors, however, specific in-depth knowledge regarding these risk factors was lacking. Findings further showed that health-risking behaviors were evident, as 25% were current smokers, 58% consumed less than the adequate intake for calcium, and 52% had scores that reflected low to moderate physical activity levels. (Anderson, Chad and Spink, 2005)

2.7 Geographic Variation in Osteoporotic Hip Fracture Incidence: The Growing Importance of Asian Influences in Coming Decades.

In June 2010, Dhanwal had demonstrated geographic variation in the incidence of hip fracture across continents and among different parts of the same region. He was also studied the epidemiology of hip fracture worldwide, with special emphasis on the geographic variation among Asian countries. He used statistical tests to examine hip fracture incidence rates. It was resulted that the highest hip fracture rates were seen in Scandinavian countries and the US and the lowest in African countries. Fracture rates were intermediate in Asian populations. Among different ethnic populations, the highest fracture rates were seen in Caucasians and the lowest in blacks. There was also a north-south gradient, particularly in Europe, where more hip fractures occur in North Europe compared to the South. (Dhanwal *et al* 2010)

2.8 Osteoporosis Knowledge of Students in Relevant Healthcare Academic Programs.

To test for adequate osteoporosis education, a study was conducted to measure osteoporosis knowledge in 206 students in relevant healthcare academic programs, such as nursing, pharmacy, physical therapy, and dietetics. The study showed that differences existed in osteoporosis knowledge in general between the programs and between different years of students in the same programs. There were also discrepancies in specific areas of osteoporosis knowledge between the classes of students, and the average scores of correctly answered items were only as high as 24.40 (76.3%) out of 32 items on osteoporosis knowledge. This study shows that students have osteoporosis knowledge and that it is not completely inadequate; however, osteoporosis knowledge could still be more sufficient, and results demonstrate the need to increase osteoporosis education in the curriculum for these healthcare academic programs to increase osteoporosis knowledge and better prepare

graduates and professionals to treat individuals with the diseases. (Nguyen and Wang, 2012)

2.9 Exploration of Osteoporosis Knowledge and Perception among Young Women in Quetta, Pakistan.

A cross-sectional study was undertaken with 162 female students of University of Baluchistan, Quetta. Knowledge was assessed by using a pre-validated self-administered questionnaire containing 20 disease related questions. Convenience sampling technique was used for data collection. Descriptive analysis was used to demonstrate the characteristics of the study population. Inferential statistics (Mann-Whitney U test and Kruskal Wallis tests, $p< 0.05$) were used to assess the significance among study variables.

162 female students were recruited into the study, 153 (81.5%) were single and science students 123(75.9%) with the majority of age group of less than 24 years. Mean age of the study participants was 21.91 ± 1.74 years. 134(82.7%) have not been previously diagnosed of bone related problem or osteoporosis. Mean score of knowledge was 13.01 ± 2.9. Department and living status were significantly associated with knowledge scores. The study concluded that females had better understanding of the disease, osteoporosis, but they need to know about the treatment for this disease in Pakistan and it is also necessary for them to know more about some specific risk factors. (Maria Tahir and Aqeel Naseem, 2015)

2.10 The Association between Vitamin D Receptor FokI Gene Polymorphism and Osteoporosis in Postmenopausal Women: A Meta-Analysis.

Jihong and Zhang conducted a research on quantitatively summarize the evidence for VDR FokI gene polymorphism and osteoporosis risk in postmenopausal women. Case-control studies containing available genotype frequencies of F/f were chosen, and Odds ratio (OR) with 95% confidence interval (CI) was used to assess the strength of this revelance.

In the case-control studies 2199 osteoporosis cases were included and 2231 controls were identified. Overall meta-analysis indicated that individuals with the homozygous ff genotype had increased risk of osteoporosis(Recessive model: OR=1.551, 95% CI: 1.035~2.325,p=0.034).In the stratified analysis, individuals with the ff genotype in the Recessive model had increased risk of osteoporosis in Asian subjects(OR=2.644, 95% CI: 1.583~4.419,p= 0.000),but not in Caucasian subjects(OR= 1.288, 95%CI: 0.783~2.118, p

= 0.318) and Mixed subjects (OR= 0.885, 95%CI: 0.686~1.141, p =0.346). A symmetric funnel plot, the Begg- test (P=0.094) suggested that lack of publication bias. The studies conducted in each of the defined number of osteoporosis—had no effect of the FokI polymorphism on osteoporosis except for the ff versus Ff+FF genotype comparison for osteoporosis subgroup. (Zhipeng Ai and Hong Liu, 2015)

2.11 Bone Loss Rate May Interact with Other Risk Factors for Fractures among Elderly Women: A 15-Year Population-Based Study.

The study was aiming to investigate fracture risk (FR) according to bone loss rate. A random sample of 1652 women aged 53.5 years was measured with dual X-ray absorptiometry in femoral neck in 1989 and 1994 and divided into tertiles of annual BL rate: high >0.84%, moderate 0.13%–0.84%, and low <0.13%. Low trauma energy fractures during following 10 years were recorded. There were no differences in FR between BL tertiles in Cox regression model. Factors predicting lower FR in Cox model were in high tertile: high T-score (HR 0.71; 95% CI 0.54–0.93, *P* = .012), no sister's fracture (HR 0.35; 0.19–0.64, *P* = .001), no mother's fracture (HR 0.52; 0.31–0.88, *P* = .015), in moderate tertile: high T-score (HR 0.69;0.53–0.91, *P* = .008) and good grip strength (HR 0.98; 0.97–0.99, *P* = .022). In low tertile there were no predictors for FR. BL predicted FR in women with mother's fracture in univariate and multivariate model (OR 2.6; 1.15–5.7, *P* = .021) but with sister's fracture this was observed only in multivariate model (OR 2.66; 1.09–6.7, *P* = .039). Accordingly, the risk factors for postmenopausal fractures, especially mother's fracture, may interact with BL. (Sirola et al., 2010)

2.12 A Review on Current Osteoporosis Research: With Special Focus on Disuse Bone Loss

In June 2011, Roy was stated that Osteoporosis is amultifactorial skeletal disorder characterized by decreased bone mass and deteriorated microarchitecture that lead to increased risk of fracture. The disuse osteoporosis refers to bone mass decrements under conditions of decreased mechanical loading, including decreased ground force reaction, muscular contraction, and microgravity-related bone loss in astronauts after space flights. Although there are many effective treatments available for primary osteoporosis, there is a lack of effective treatments for disuse osteoporosis. This is because that the aetiology, pathophysiology, and resultant pathology of disuse osteoporosis differ from those of

primary osteoporosis. The objective of this paper is to examine the unique pathology and underlying pathophysiology of disuse osteoporosis. (Roy *et al* 2011)

2.13 Scientific Basis for the Potential Use of Melatonin in Bone Diseases: Osteoporosis and Adolescent Idiopathic Scoliosis

In March 2010, Sanchez-Barcelo was researched to analyze the data supporting the possible role of melatonin on bone metabolism and its repercussion in the etiology and treatment of bone pathologies such as the osteoporosis and the adolescent idiopathic scoliosis (AIS). Melatonin may prevent bone degradation and promote bone formation through mechanisms involving both melatonin receptor-mediated and receptor-independent actions. A variety of in vitro and in vivo experimental studies, although with some controversial results, point toward a possible role of melatonin deficits in the etiology of osteoporosis and AIS and open a new field related to the possible therapeutic use of melatonin in these bone diseases. (Sanchez-Barcelo *et al* 2010)

2.14 The Relationship between Physical Activity and Bone during Adolescence Differs according to Sex and Biological Maturity.

Belinda R. Beck, Benjamin K. Weeks conducted a research on examining the relationships between bone mass, physical activity, and maturational status in healthy adolescent boys and girls. In this survey Ninety-nine early high-school (Year 9) students were recruited. Physical activity and other lifestyle habits were recorded via questionnaire. Anthropometrics, muscle power, calcaneal broadband ultrasound attenuation (BUA), bone mineral content (BMC), and lean tissue mass were measured. Maturity was determined by Tanner stage and estimated age of peak height velocity (APHV). The result shows that Boys had greater APHV, weight, height, muscle power, and dietary calcium than girls ($P < .05$). Boys exhibited greater femoral neck BMC and trochanteric BMC while girls had higher BUA and spine BMAD ($P < .05$). Physical activity and vertical jump predicted BMAD and BUA most strongly for boys whereas years from APHV were the strongest predictor for girls. The research concluded that Sex-specific relationships exist between physical activity, maturity and bone mass during adolescence. (Weeks and Beck, 2010)

2.15 Whole-Body versus Local DXA-Scan for the Diagnosis of Osteoporosis in COPD Patients

In 2010, Lidwien was studied to assess whole-body BMD and BMD of the hip and lumbar spine (local DXA) in COPD patients and compare the prevalence of osteoporosis at these locations because the best location for BMD measurement in COPD has not been determined. Whole body as well as local DXA-scan were made in 168 COPD patients entering pulmonary rehabilitation. Prevalence of osteoporosis was determined. Characteristics of patients without osteoporosis were compared to patients with osteoporosis on local DXA. Significant differences in patient characteristics between patients without osteoporosis based on both DXA measurements and patients with osteoporosis based on local DXA only were found. (Lidwien *et al* 2010)

2.16 A New Predictive Index for Osteoporosis in Men under 70 Years of Age: An Index to Identify Male Candidates for Osteoporosis Screening by Bone Mineral Density.

Lee Oh Kim conducted a research on bone mineral density (BMD) screening guidelines for osteoporosis in men. The aim of the study was to set up a predictive index for the osteoporosis (PIO) in men under 70 years of age and present the optimal cutoff value of it, so that clinicians might use it to identify male candidates who benefit from taking the BMD screening.

The result of the survey was fairly well and thus can be used with its cutoff point to identify men under 70 years of age who need BMD screening. A total of 359 men were included. Age, weight, and current smoking status turned out to be significant predictors for osteoporosis. The PIO was as follows: [age(years) + 10 (for current smoker)]/weight(kg). Compared to other variables, the PIO showed the greatest predictive performance with the optimal cutoff point being 0.87 at which sensitivity and specificity were 71.9% and 70.0%, respectively. (Kim, Kim and Kong, 2014)

2.17 Osteoporosis Self-Assessment Tool Performance in a Large Sample of Postmenopausal Women of Mendoza, Argentina.

Fernando D. Saraví, conducted the study on Osteoporosis Self-Assessment Tool Performance on postmenopausal women. The Osteoporosis Self-assessment Tool (OST) is a clinical instrument designed to select patients at risk of osteoporosis, who would benefit

from a bone mineral density measurement. The OST only takes into account the age and weight of the subject. It was developed for Asian women and later validated for European and North American white women. The performance of the OST in a sample of 4343 women from Greater Mendoza, a large metropolitan area of Argentina, was assessed. Dual X-ray absorptiometry (DXA) scans of lumbar spine and hip were obtained. Patients were classified as either osteoporotic (N = 1830) or non osteoporotic (n = 2513) according to their lowest T-score at any site. Osteoporotic patients had lower OST scores ($P < 0.0001$). A receiver operating characteristic (ROC) curve showed an area under the curve of 71% ($P < 0.0001$), with a sensitivity of 83.7% and a specificity of 44% for a cut-off value of 2. Positive predictive value was 52% and negative predictive value was 79%. The odds ratio for the diagnosis of osteoporosis was 4.06 (CI95 3.51 to 4.71; $P < 0.0001$). It is concluded that the OST is useful for selecting postmenopausal women for DXA testing in the studied population. (Saraví, 2013)

2.18 Association between Body Mass Index and Bone Mineral Density in Patients Referred for Dual-Energy X-Ray Absorptiometry Scan in Ajman, UAE.

In 2001, Fawzy was demonstrated that Body Mass Index (BMI) is a good indicator for measurements of Bone Mineral Density (BMD) which measures the density of minerals present in the bones using a special scan. This study was conducted to assess the association between BMI and status of BMD among 101 individuals who underwent Dual-Energy X-ray Absorptiometry (DEXA) scan. 39 subjects had normal and 62 had low bone mineral density. BMD was low in 82.4% of people with normal BMI, 78.1% among overweight, and 44.2% among obese. There was a statistically significant association between these two variables ($\boldsymbol{P} < .001$). Low BMD was recorded in 59.1% of females and 76.9% of males. Association between advancing age and lower BMI is an important risk factor in the occurrence of low BMD. (Fawzy et al., 2011)

2.19 Concern and Risk Perception: Effects on Osteoprotective Behaviour

Barcenilla was studied to determine the effect that level of concern for osteoporosis, as well as self-perceived risk of osteoporosis and fracture, has on supplementation use, seeking medical advice, bone mineral density (BMD) testing, and antiosteoporosis medication (AOM) use. Study outcomes from self-administered questionnaires included calcium and vitamin D supplementation, self-reported seeking of medical advice regarding osteoporosis, BMD testing, and AOM use in the last 12 months at the late assessment.

Heightened self-perceived risks of osteoporosis and fracture both significantly increased the likelihood of seeking medical advice and BMD testing while elevated self-perceived risk of fracture increased AOM use. (Barcenilla *et al* 2014)

2.20 Osteoporosis Knowledge, Self-Efficacy, and Beliefs among College Students in the USA and China

This study investigated differences in osteoporosis knowledge, self-efficacy,and health beliefs among Chinese and American college students. Information obtained will be used in developing osteoporosis prevention programs for younger adults. Chinese (n = 409) and US (n = 408) college students completed the Osteoporosis Health Belief, Self-Efficacy, and Knowledge Tests. Differences were seen in osteoporosis knowledge (Mus = 14.52, MChinese = 11.82), exercise knowledge (Mus = 8.16, MChinese =9.04),calcium knowledge (Mus =8.47,MChinese =9.73), perceptions of exercise benefits (Mus =24.07,MChinese =21.09), calcium benefits (Mus =23.17, MChinese =18.36), exercise barriers (Mus =11.75, MChinese =14.96), calcium barriers (Mus =13.04, MChinese = 15), and exercise self-efficacy (Mus = 73.71, MChinese = 63.81). US college students know more about osteoporosis and its risk factors; however, there are similarities in perception of risk between US and Chinese students. Chinese students perceive greater barriers to reducing their risk through exercise and dietary calcium intake. (Ford et al., 2011)

Significance of the study:

The international incidences of osteoporosis and the hip fracture syndrome are increasing at alarming rates. The estimated increases in rates of fracture over the next decade may also prove to be conservative, because of progressive increases in numbers of elderly people who will fall because of muscular degeneration, failing vision, postural hypotension, and loss of cognitive function resulting from the ever-increasing abuse of mixtures of drugs. (Faulkner et al., 2006) Changing patterns of hip fracture care, including extended use of hospital beds and of rehabilitation and nursing-home beds could lead to substantial and escalating annual costs in national health care budgets. Such a budget currently approximates 10 billion dollars in the United States alone. (Gonzalez-Gay et al., 2005)

Osteoporosis is a condition characterized by low bone densities and disordered bone micro-architecture. Complications of osteoporosis are a major health problem. The high costs related to morbidity and mortality from vertebral compression fractures and hip fractures have been well documented. Worldwide, these fractures constitute a major medical burden for the elderly and a public health burden for the community. Several studies have shown that the estimation of bone mineral density can predict future fracture risk among women. (Cooper et al., 1992)

The latest report from the National Osteoporosis Society emphasizes the unnecessary suffering that women are experiencing. It makes painful reading. One woman in every four who fractures a hip never comes out of hospital — she dies there. This is a statistic provided by the UK-based National Osteoporosis Society. (Peters et al., 2009) The trouble is osteoporosis is the "silent disease" because there are no symptoms prior to a fracture. However, once a person has broken a bone, their risk of breaking another — a fragility fracture — increases significantly. Around 300,000 fragility fractures occur every year in the UK, often in the spine. After the first break, one in eight will break another bone within a year and a quarter within five years. (Saraví, 2013)

Aim and objective of the study:

1. To know the students/adult knowledge of osteoporosis in Bangladesh
2. To find out the presence of risk factors associated with osteoporosis among them.
3. To find out their habitual patterns that may influence the formation, early diagnosis and prevalence of osteoporosis.

CHAPTER 3

METHODOLOGY

3. Methodology:

3.1 Study Area

The data was collected from different universities of Bangladesh including all classes of students and some graduate and service holder also. The collections are done in Dhaka city. Most of the participants are from universities include Dhaka University, North South University, East West University, BRAC University, Independent University Bangladesh, Bangladesh Medical Collage

3.2 Total Number of participants

- Data was collected from 200 general people.

3.3 Inclusion Criteria

- Age should be 18 to 30.
- Both Male and Female.

3.4 Exclusion Criteria

- People age not students.
- Unwilling to participate.

3.5 Procedure

- For collecting data, a questionnaire was prepared according to required information.
- The collected data were analyzed with the help of Microsoft Office Excel and filtered

Out accordingly for analysis. Some graphical representations were made from those analysis statuses.

CHAPTER 4

RESULT

4. Result

4.1 Gender of the subjects of the survey:

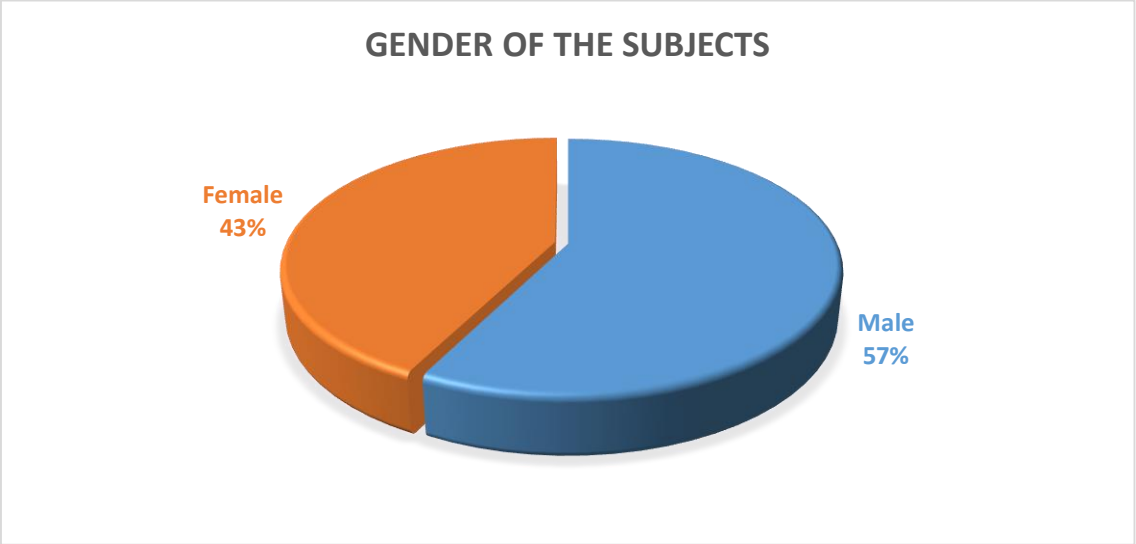


Figure 4.1: gender of the subjects

Among the populations 57% are male and 43% are female.

4.2 Marital Status:

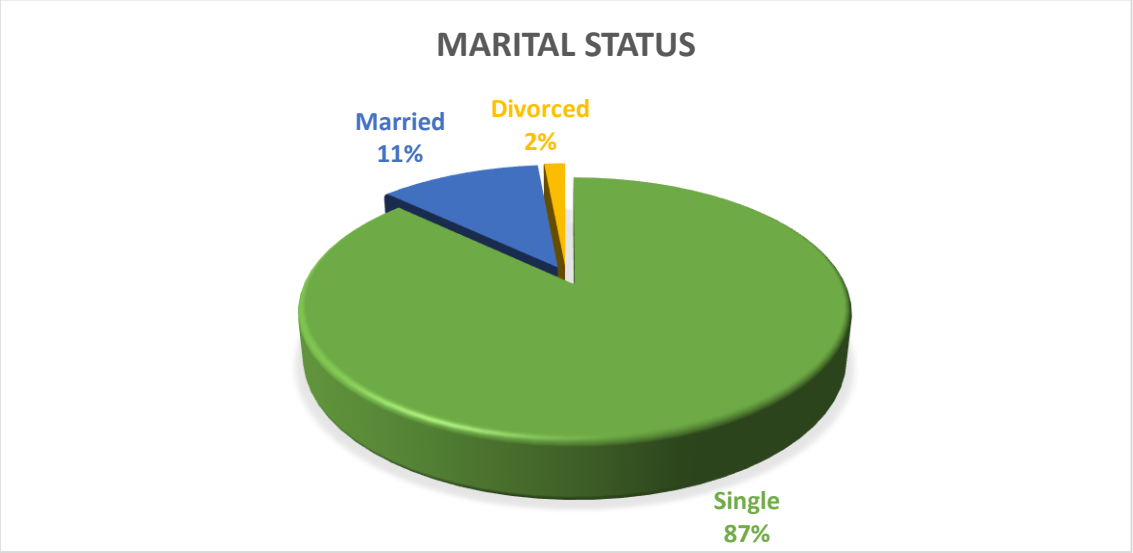


Figure 4.2: Marital Status of study population

Majority of the participants (87%) were single. Only few of them were married (11%) and divorced (2%).

4.3 Age of the subjects:

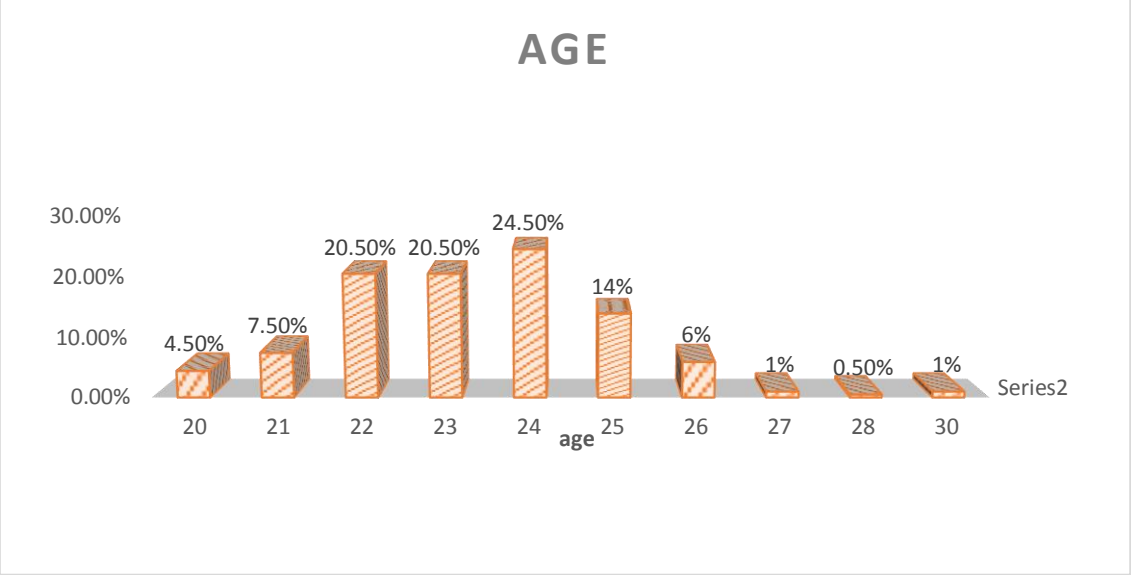


Figure 4.3: Age of the subjects

Among the all (200) participants most are between 22 to 25 years of age. Average age was 23 years.

4.4 Education level of study population:

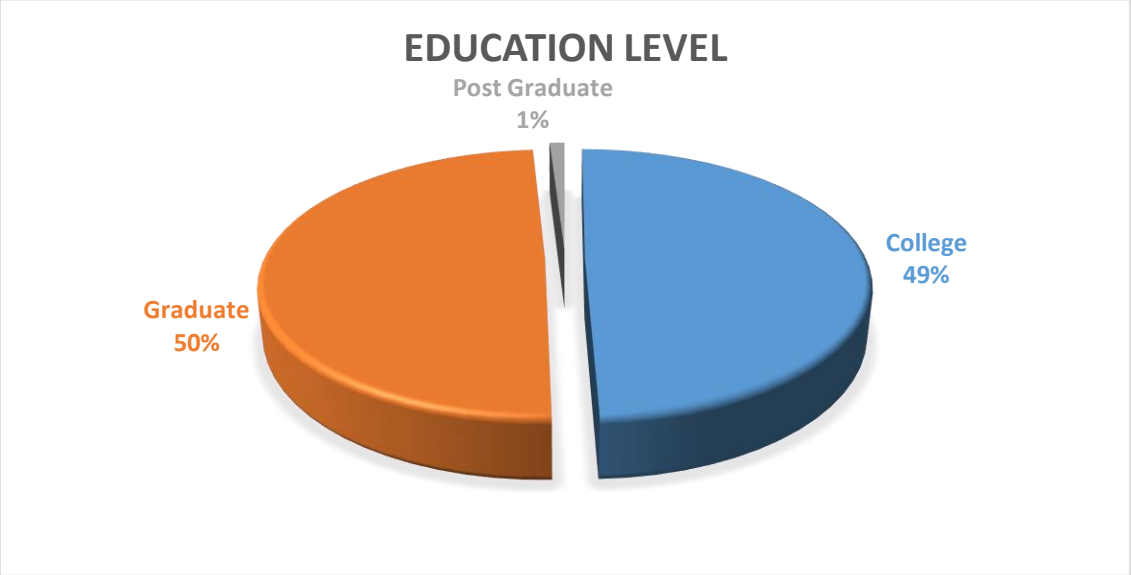


Figure 4.4: Education level of study population

Every participants are literate where 50% complete their graduation and 49% completed their college.

4.5 Occupation of study population:

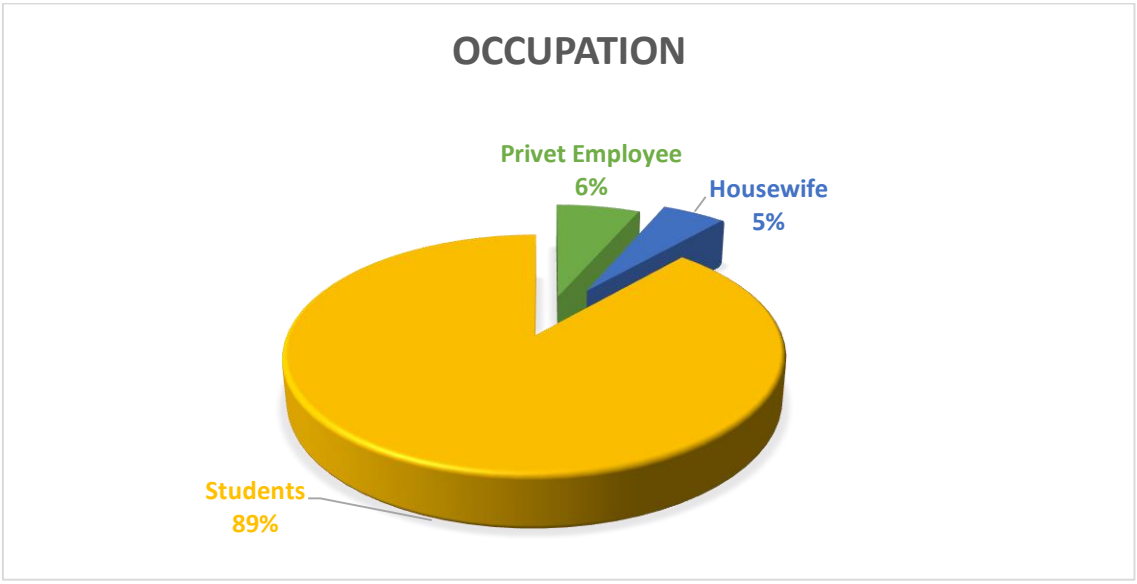


Figure 4.5: Occupation of study population

Majority of the participants are students (89%).

4.6 Living with Family:

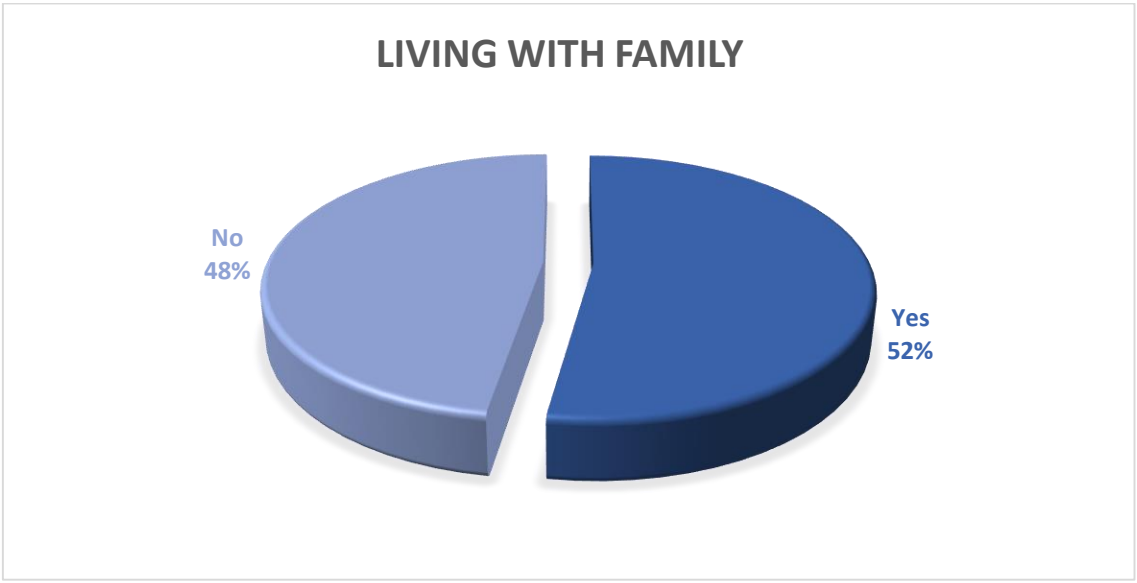


Figure 4.6: Living with Family

Among all (200) the respondents living with family (52%) and the rest of them don't live with family (48%).

4.7 Knowledge about what Osteoporosis is:

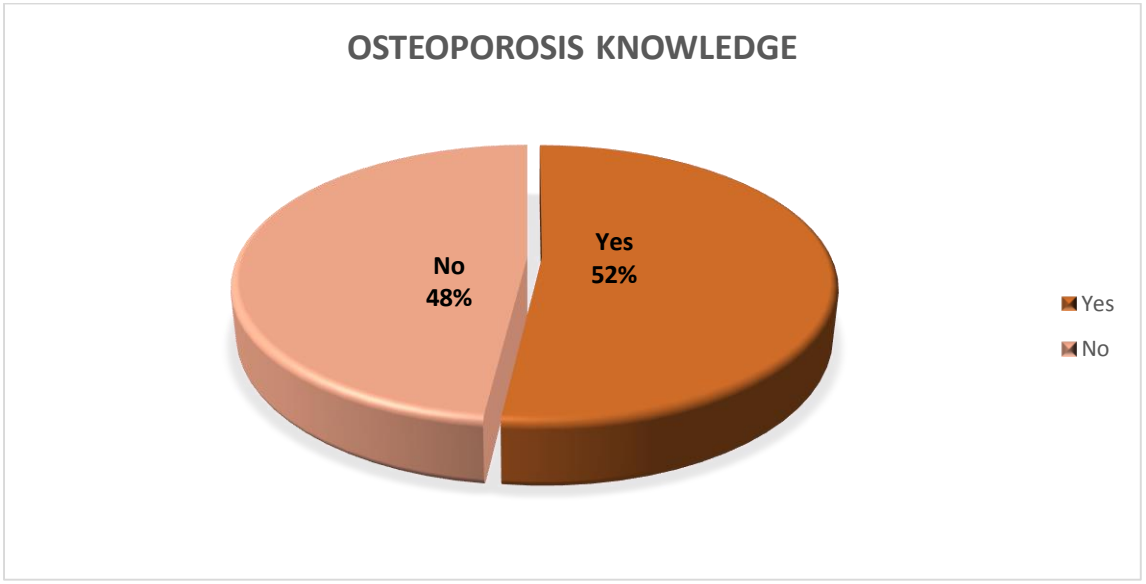


Figure 4.7: Knowledge about what Osteoporosis is

Among 200 participants 52% know about Osteoporosis and the rest of them 48% don't know.

4.8 Family history of Osteoporosis

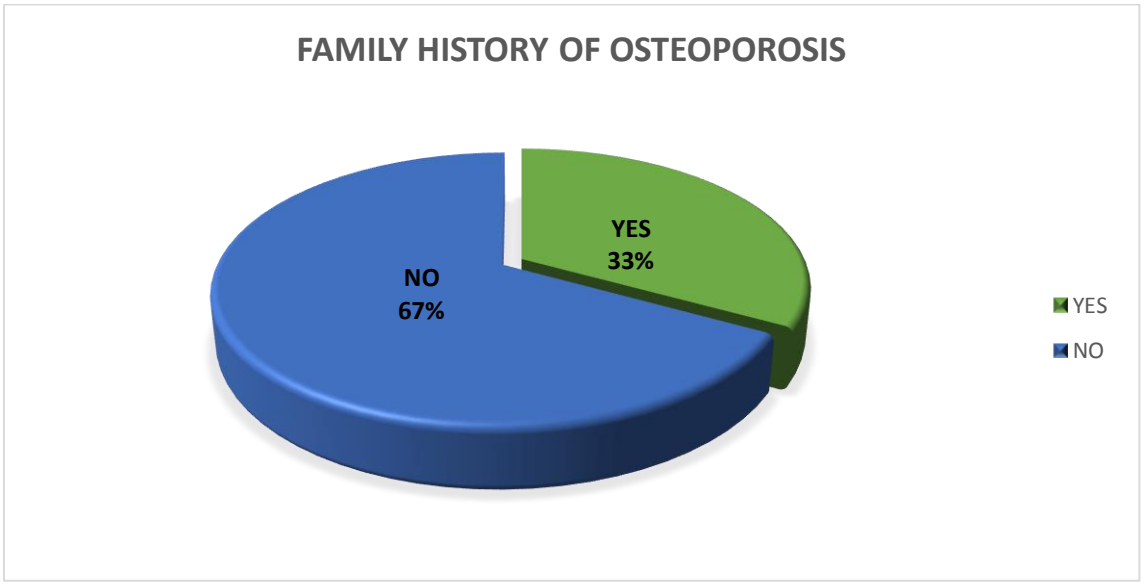


Figure 4.8: Family history of Osteoporosis

33% of participants have a family history of Osteoporosis and the rest of 67% do not have that history.

4.9. Maternal history of Osteoporosis

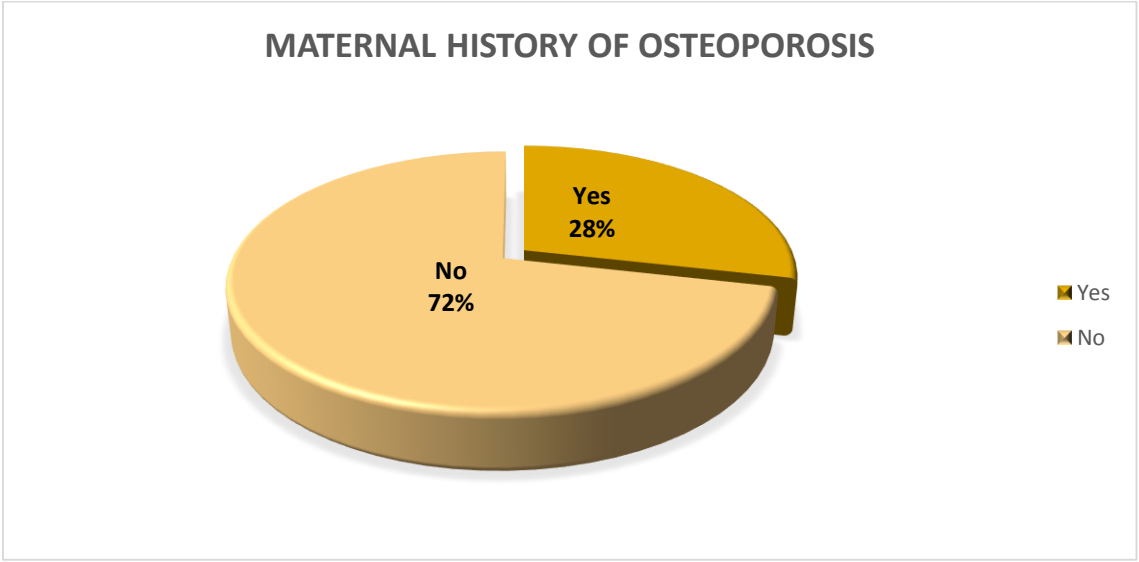


Figure 4.9: Maternal history of Osteoporosis

Among 200 of participants 28% having a maternal history of Osteoporosis and 72% are not having any maternal history of Osteoporosis.

4.10 Maternal history of fracture

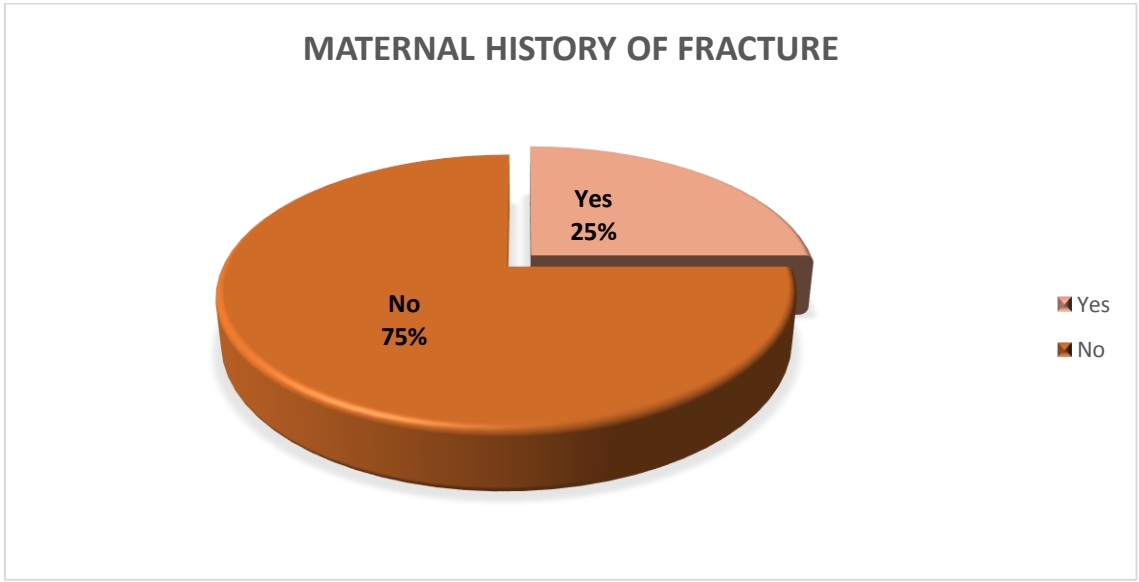


Figure 4.10: Maternal history of fracture

Among 200 of participants 25% having a maternal history of fracture and 75% are not having any maternal history of fracture.

4.11 Knowledge about Major types of Osteoporosis

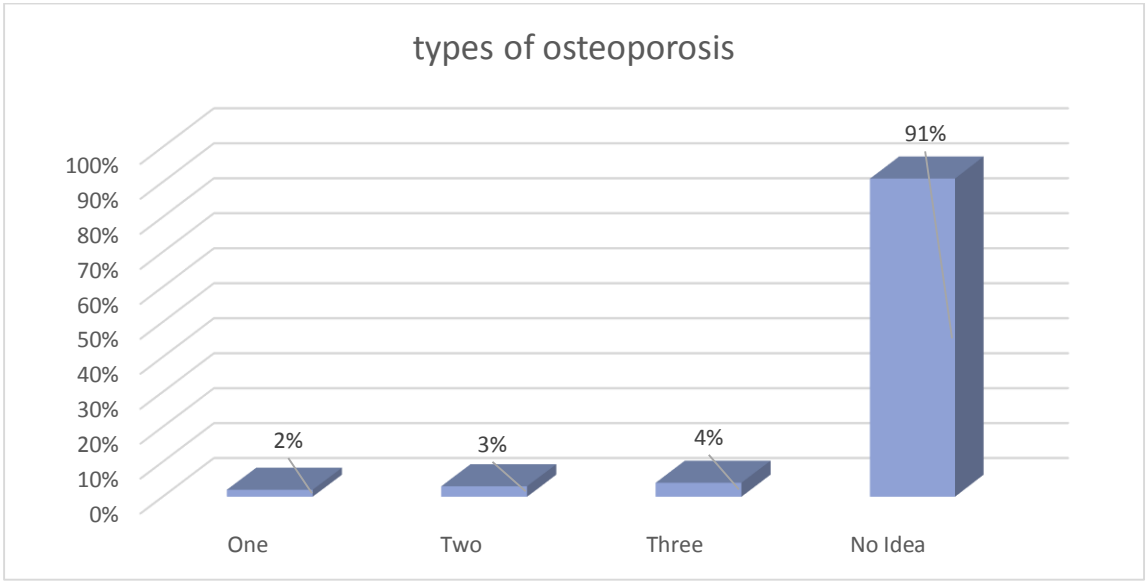


Figure 4.11 Knowledge about Major types of Osteoporosis

Among 200 of participants 91% have no idea about the types of Osteoporosis, 4% think three types, 3% think two types and 2% think one type.

4.12 Diagnosed with bone problem

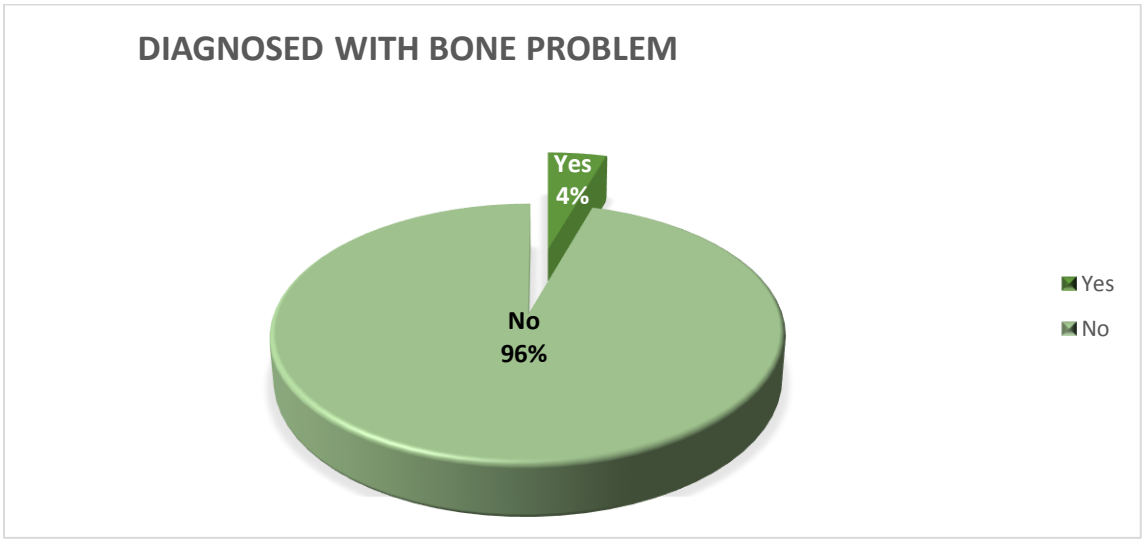


Figure 4.12 diagnosed with bone problem.

Among 200 of participants 4% have diagnosed with bone problem and 96% have not diagnosed yet.

4.13 smoke cigarette:

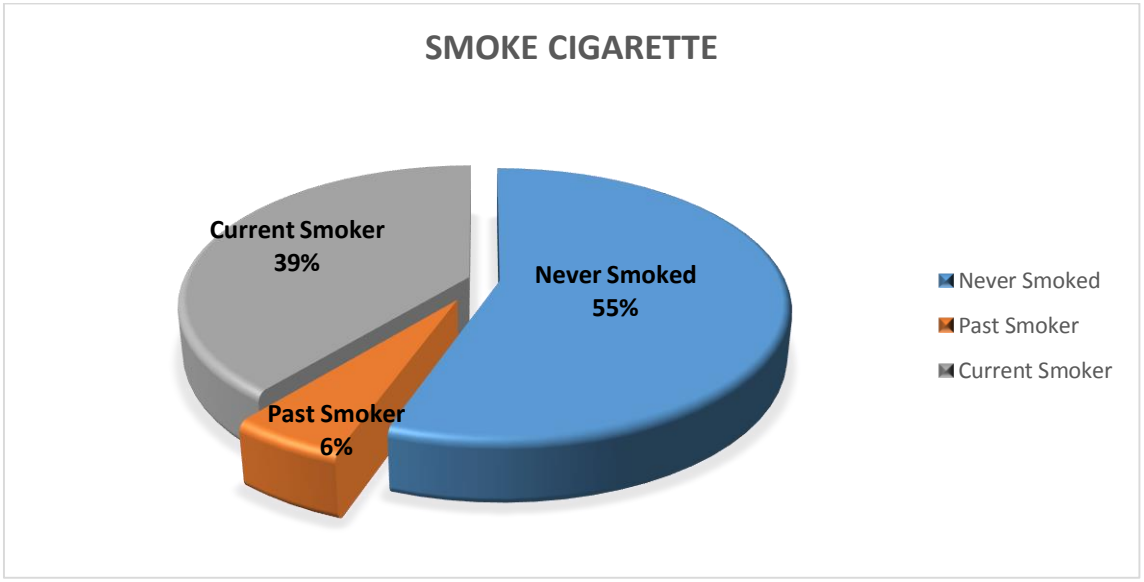


Figure 4.13 Cigarette smoking

Among the participants 55% never smoked cigarette, 6% were past smoker and 39% are current smoker.

4.14 Concerned about getting osteoporosis:

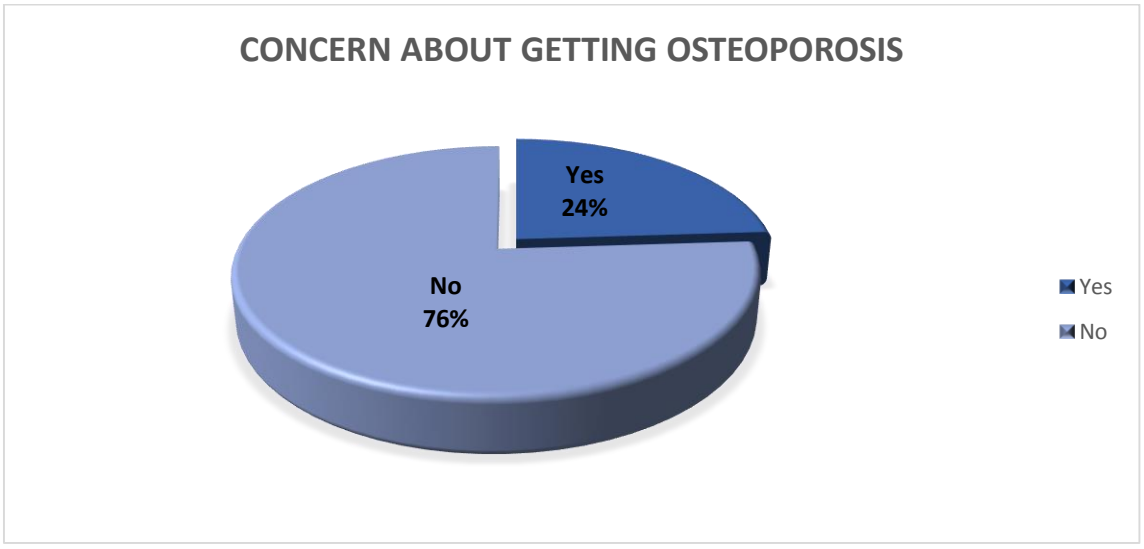


Figure 4.14: Concerned about osteoporosis.

It was seen in our study that among the participants 24% are concerned about osteoporosis and 76% are not concerned about osteoporosis.

4.15 Knowledge about main factors that influence bone density:

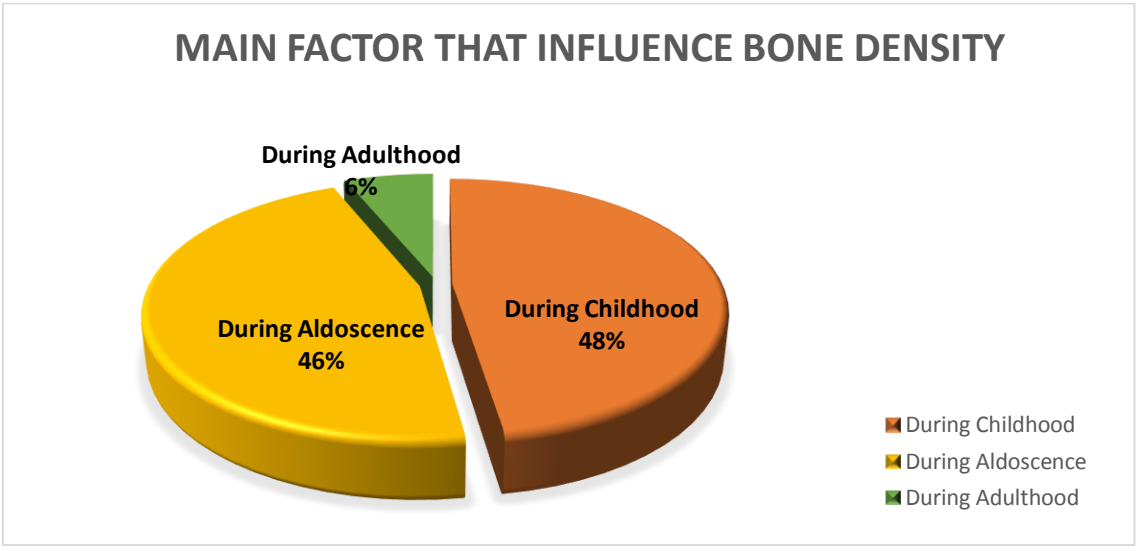


Figure 4.15: Knowledge about main factors that influence bone density

Among the participants most of them around 46% thought calcium intake during adolescence and 48% thought calcium intake during childhood is the main factor that influence bone density.

4.16 Chances of having osteoporosis believed by the subjects:

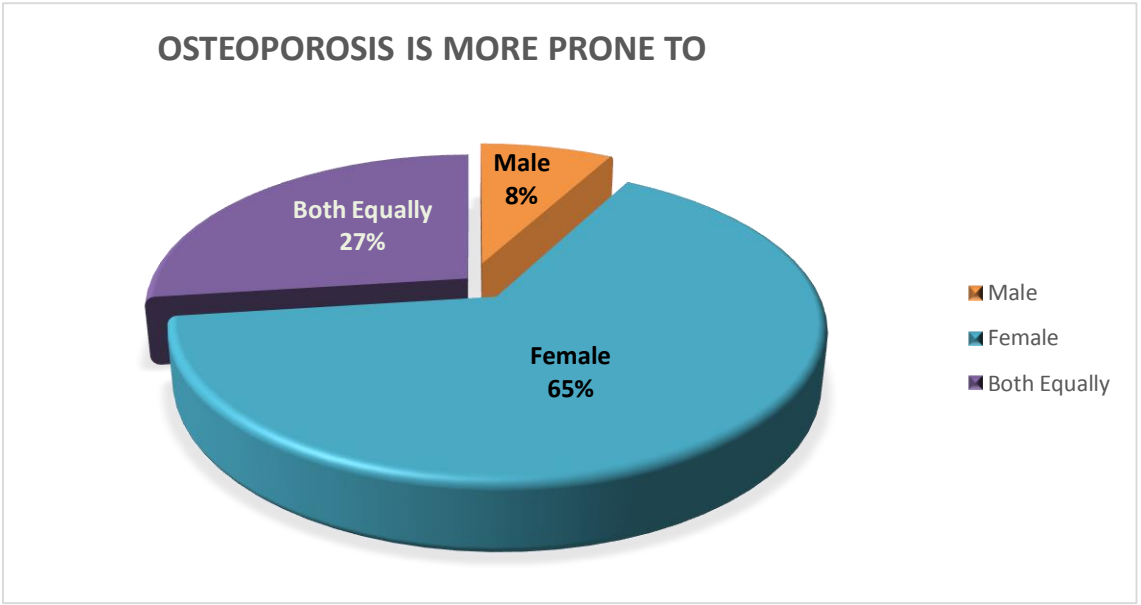


Figure 4.16: Chances of having osteoporosis believed by the subjects

Among the population 65% believe that osteoporosis is more prone to female.

4.17 Sources of Osteoporosis knowledge

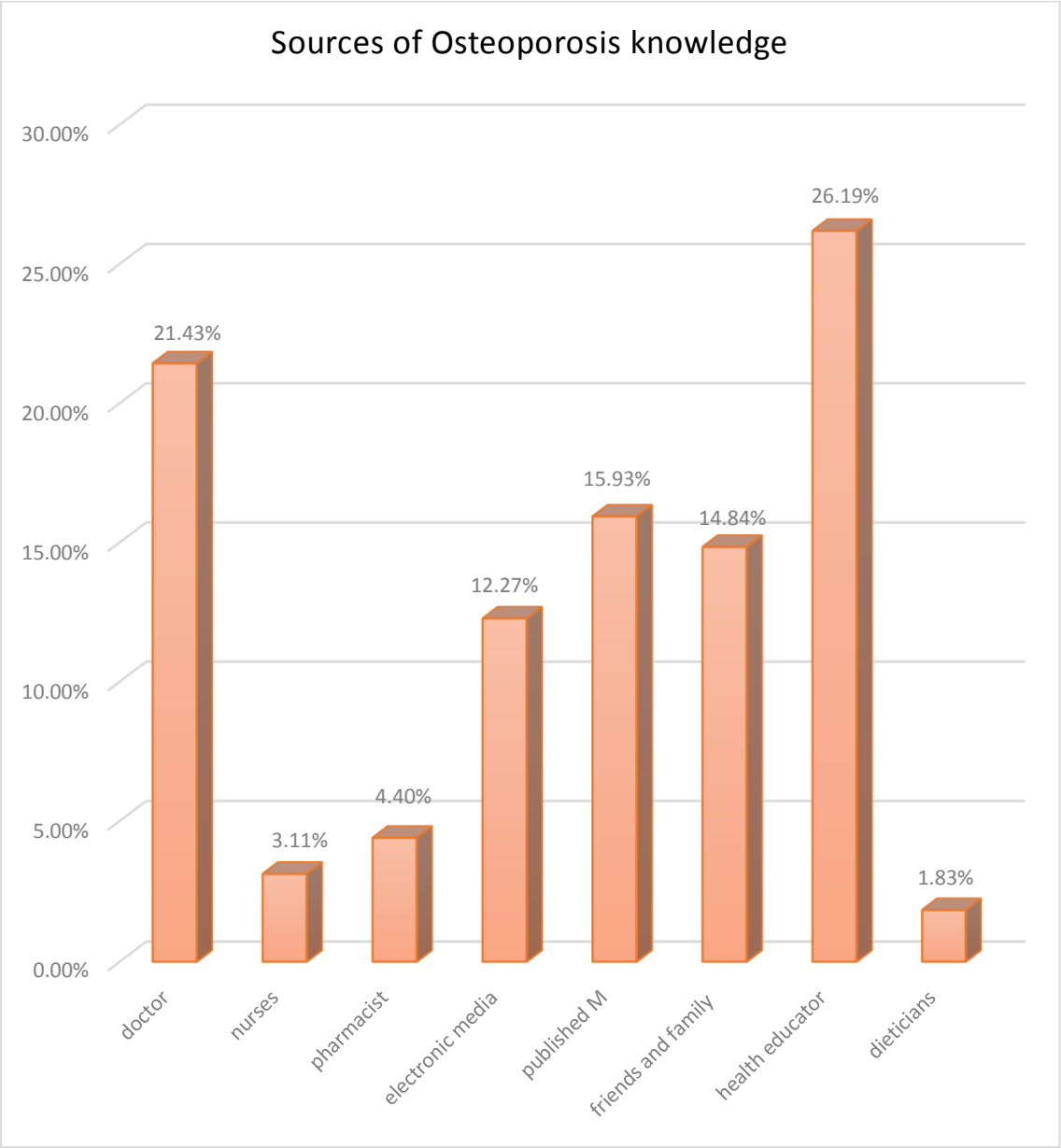


Figure 4.17: Sources of osteoporosis knowledge

Among the participants 26% from health educator 21% have known about osteoporosis from doctors, 12% from electronic media, 15% from friends and family and 15% from published media and so on.

4.18 General knowledge regarding health of bones

	Yes(%)	No(%)
Bones are living tissue that need physical activity to be healthy and strong.	100%	0%
Regular physical activity helps your body use calcium more efficiently.	100%	0%
Physical activity can help keep you from losing muscle when you are dieting to lose weight.	98%	2%
It is difficult to get the calcium you need from vegetable alone	96%	4%
Adolescents need more calcium than children age 6	95%	5%
Drinking too much cola beverage can be harmful to your bones	97%	3%
Drinking too much coffee can be harmful to your bones	95%	5%
Cigarette smoking can lead to osteoporosis	96%	4%
Osteoporosis is preventable disease	95%	5%
What the risk factors of osteoporosis	37%	63%

Table 4.18: General knowledge about osteoporosis.

4.19 Knowledge about the risk factors of Osteoporosis

4.19.1 Knowledge about uncontrollable risk factors:

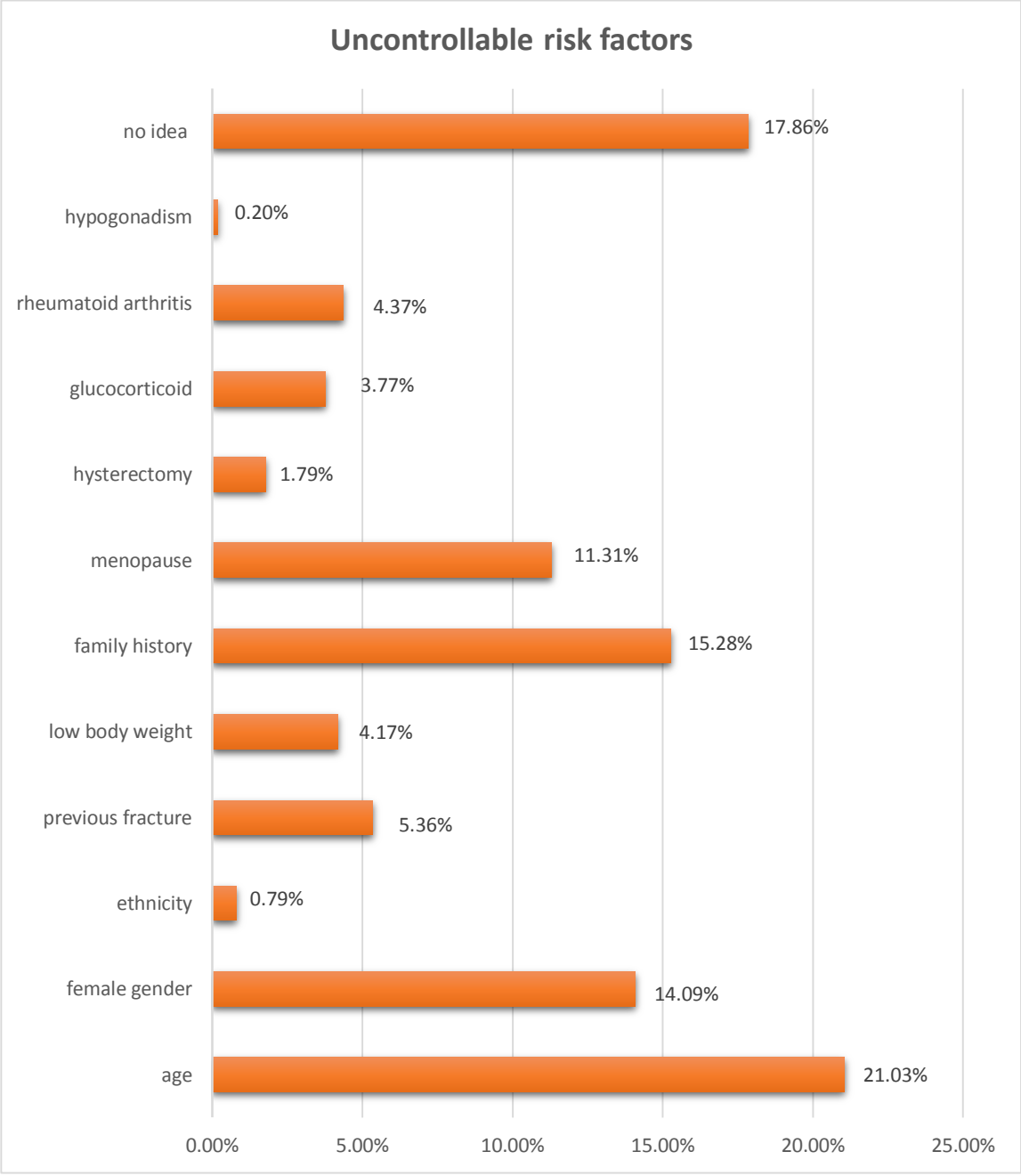


Figure 4.19.1: Knowledge about Uncontrollable risk factor of osteoporosis

In this survey it was seen that among the uncontrollable risk factors Most of the patients had selected age as the uncontrollable risk factor among all the others.

4.19.2 Knowledge about disorder that affect the skeleton:

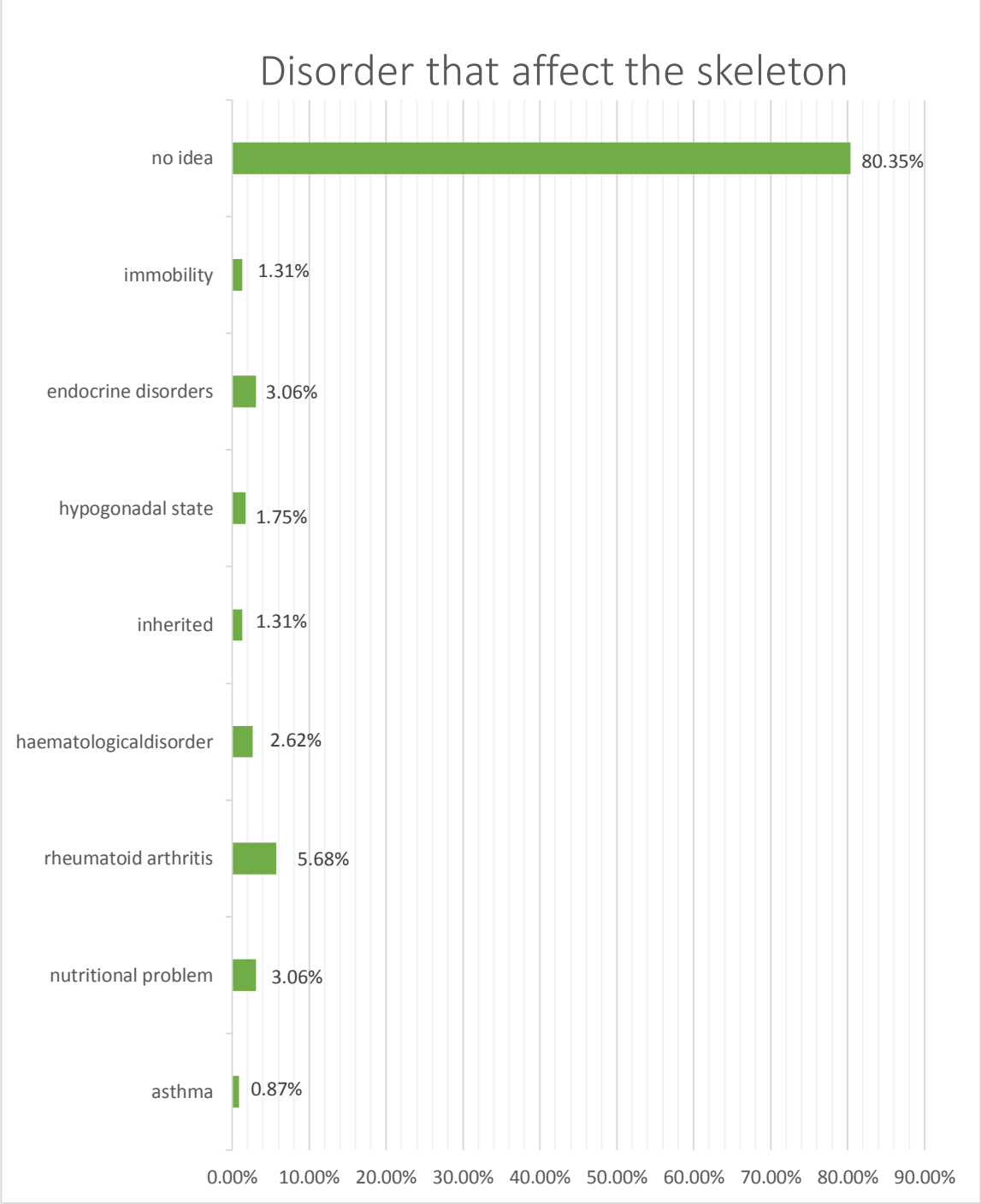


Figure 4.19.2: Knowledge about disorders that affect the skeleton

Among the populations most of them round 81% do not have any idea about the disorders that affect the skeleton.

4.19.3 Knowledge about medical treatment affecting bone health:

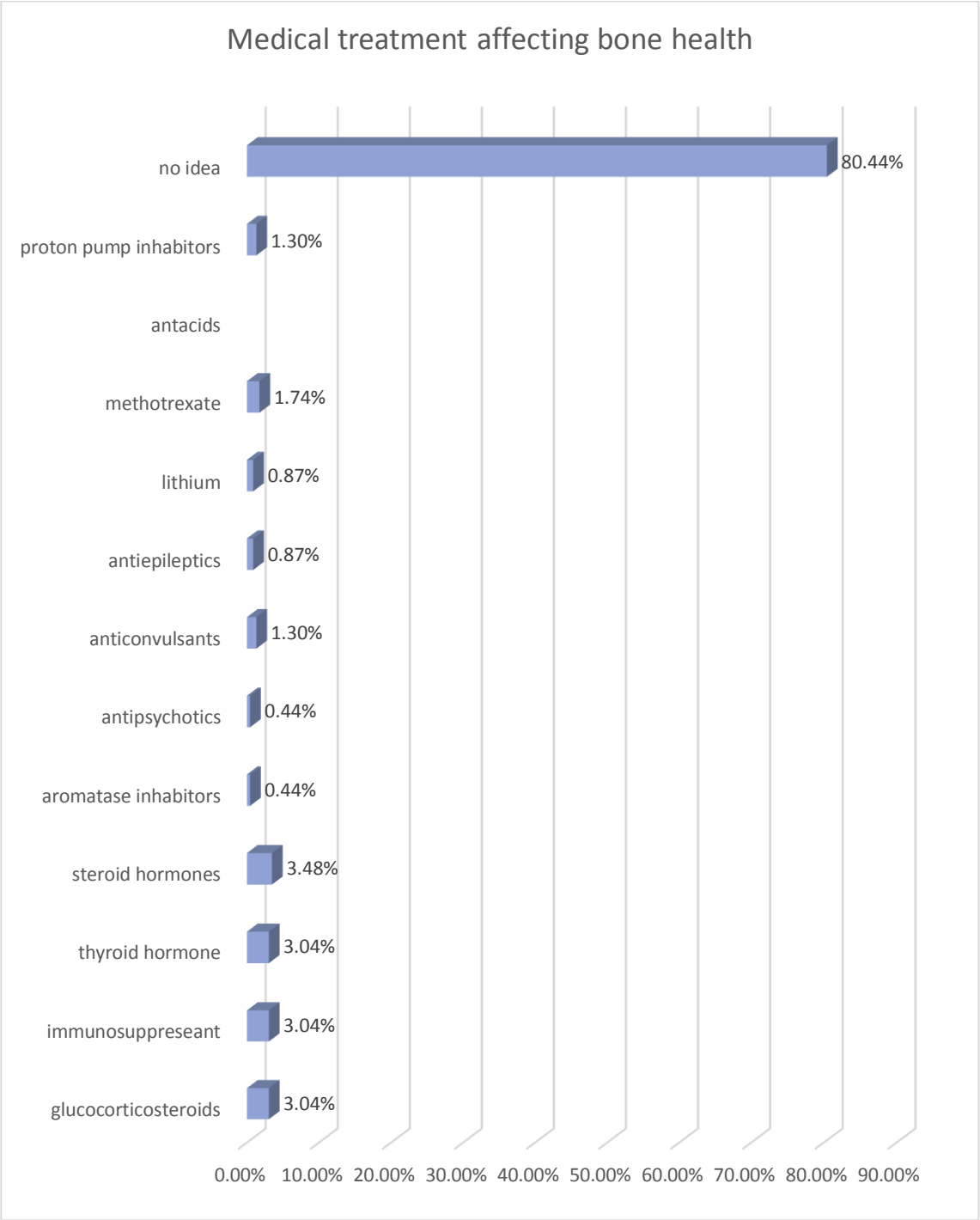


Figure 4.19.3: Knowledge about Medical treatment affecting bone health

It was seen that most of the participants (80%) do not have any idea about the medical treatment that can affect the bone health.

4.19.4 Knowledge about controllable risk factors:

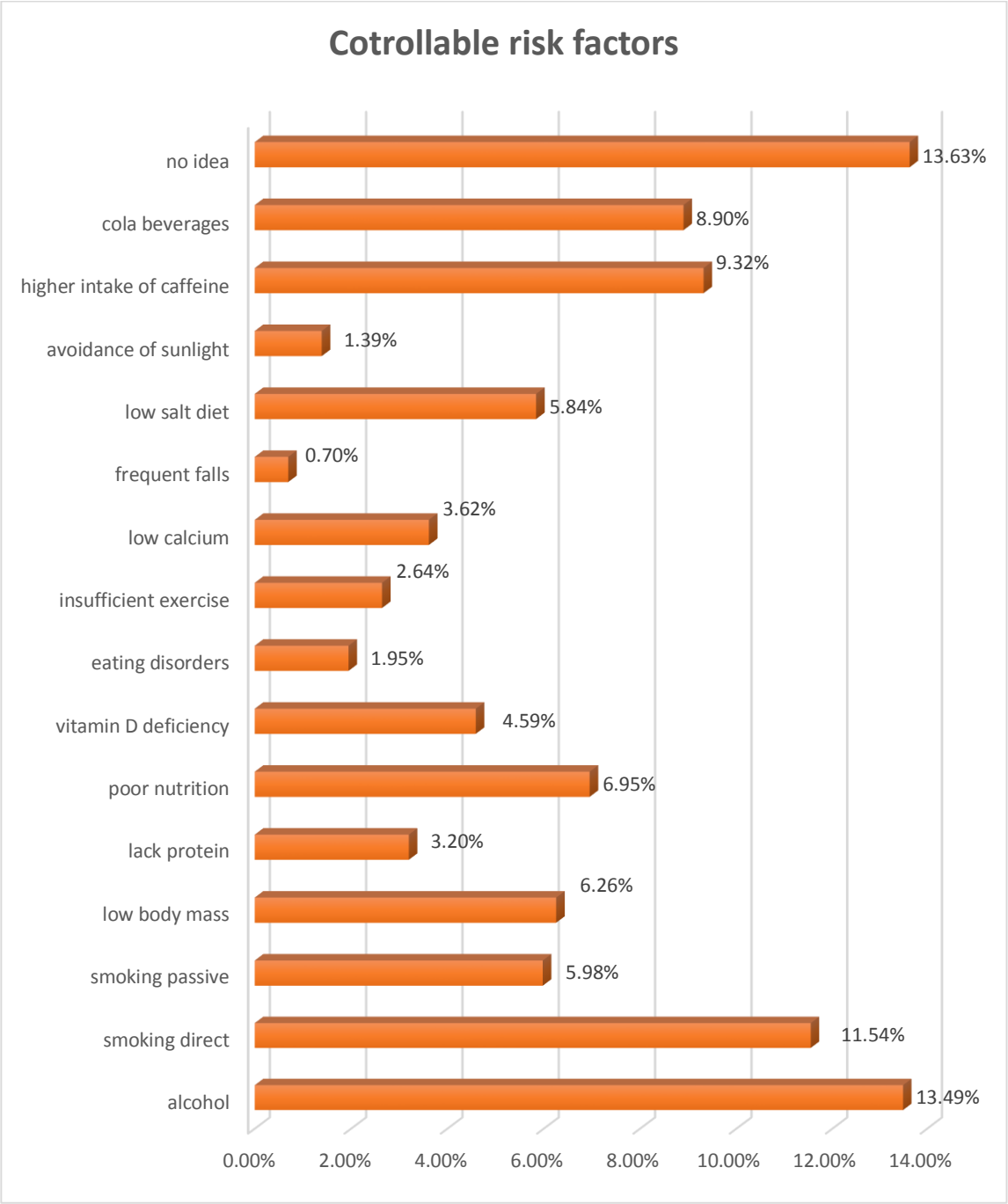


Figure 4.19.4: Knowledge about controllable risk factors

Among all the patients 14% thought that alcohol is the controllable risk factor for osteoporosis, 12% thought smoking direct and 14% don't have any idea about the controllable risk factors.

4.20 Knowledge about Osteoporosis sign and symptoms:

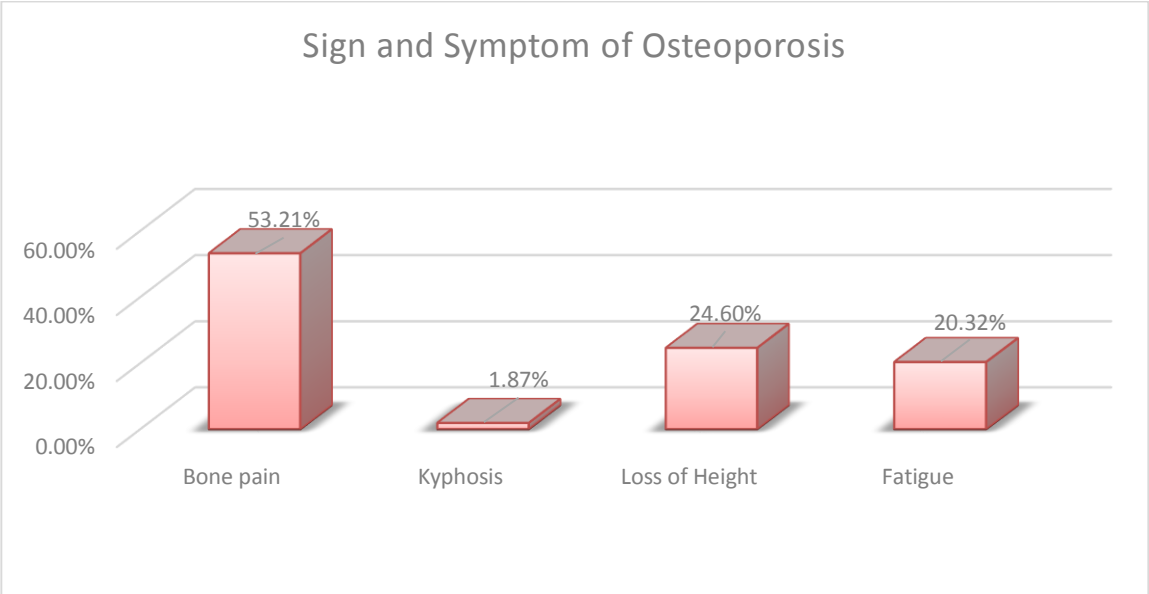


Figure 4.20: Knowledge about Osteoporosis sign and symptoms

Among the populations 53.21% picked up bone pain, 24.60% think loss of height, 20.32% think as the sign and symptoms of osteoporosis and only 1.8% picked up kyphosis.

4.21 Knowledge about complications of osteoporosis:

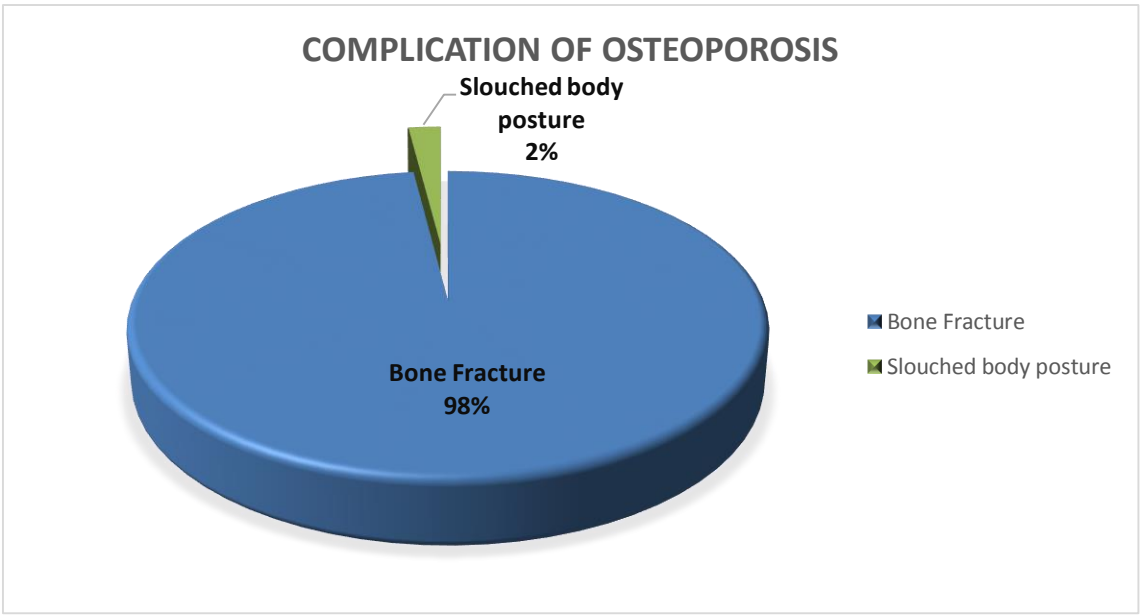


Figure 4.21: Knowledge about complications of osteoporosis

Among the populations 98% thought bone pain as the major complication of osteoporosis.

4.22 False belief regarding the prevention of osteoporosis

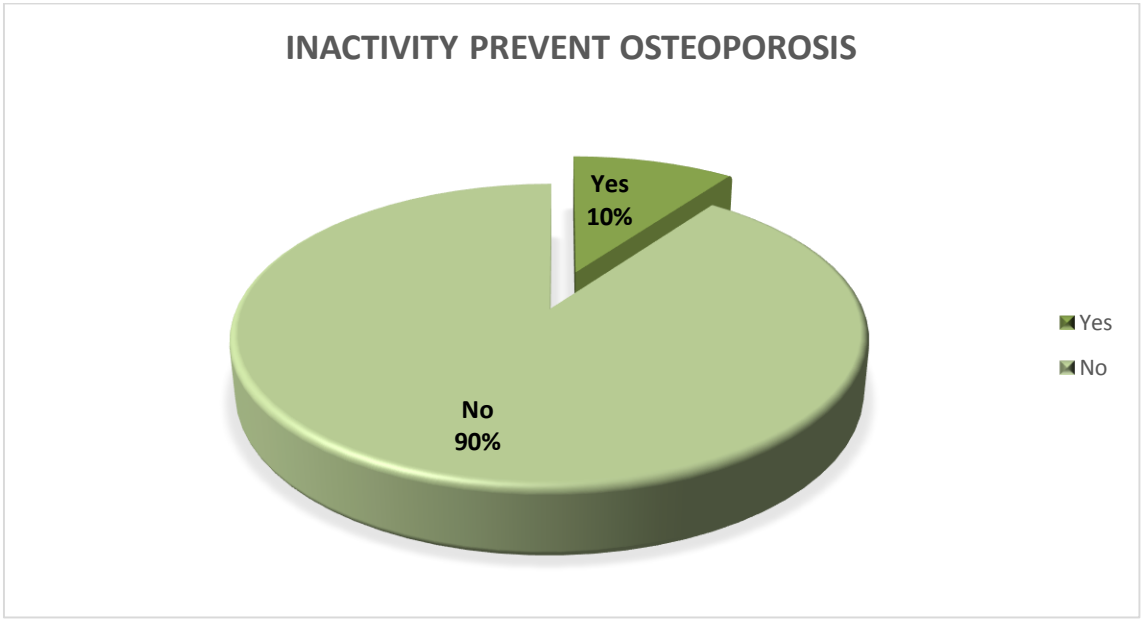


Figure 4.22.1: inactivity can prevent osteoporosis.

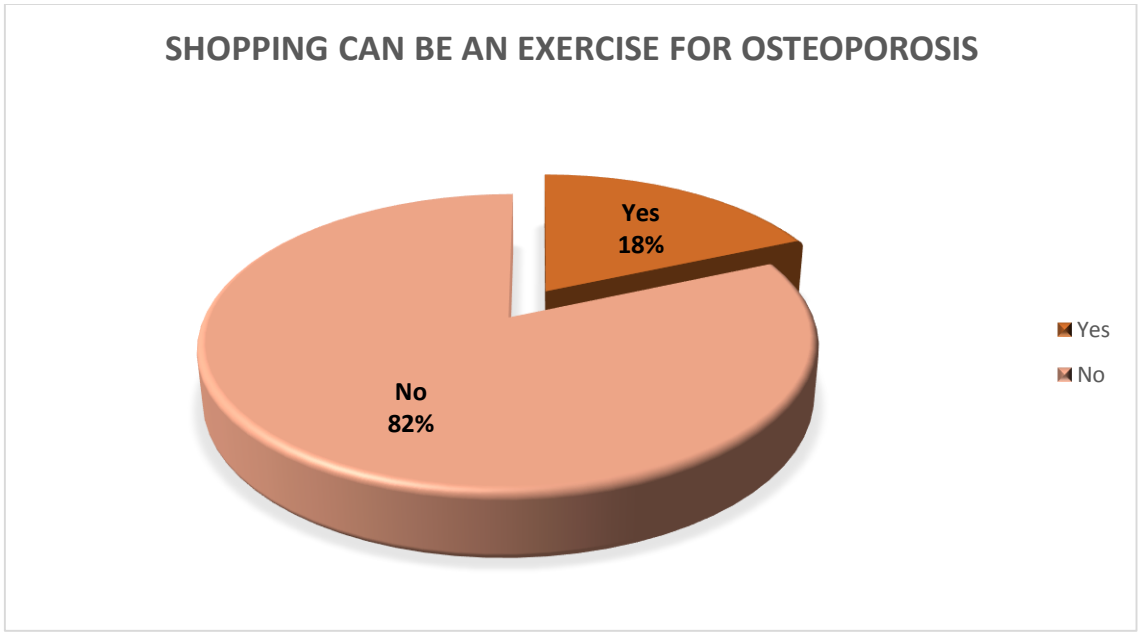


Figure 4.22.2: shopping can be an exercise for osteoporosis.

Among the populations 90% thought inactivity cannot prevent osteoporosis and 82% thought shopping cannot be an exercise for osteoporosis.

4.23: Preventive measure that can be taken for osteoporosis:

Preventive measures	Never (%)	Sometimes (%)	Always (%)
Direct exposure to face and hand to sunlight for more than 30 minutes a week	59%	28%	13%
Reading materials about osteoporosis	75%	17%	8%
Checking bone mass density	76%	17%	7%
Adequate calcium consumption (more than 1200mg daily)	77%	17%	6%
Adequate osteoprotective exercise(more than 90 minutes a week)	80%	17%	3%
Ensure appropriate intake of protein in the diet	40%	47%	13%
Appropriate supply of vitamin C	35%	54%	11%
Appropriate supply of vitamin D	36%	53%	11%
Reasonable physical exercise	42%	32%	26%

Table 4.23: Preventive measures of osteoporosis.

Most of the participant choose the option never of the preventive measures for osteoporosis some are taken sometimes and a little percentage are always but not knowing as preventive measure for osteoporosis only do as their daily routine.

4.24 Knowledge about Tools that can prevent osteoporosis:

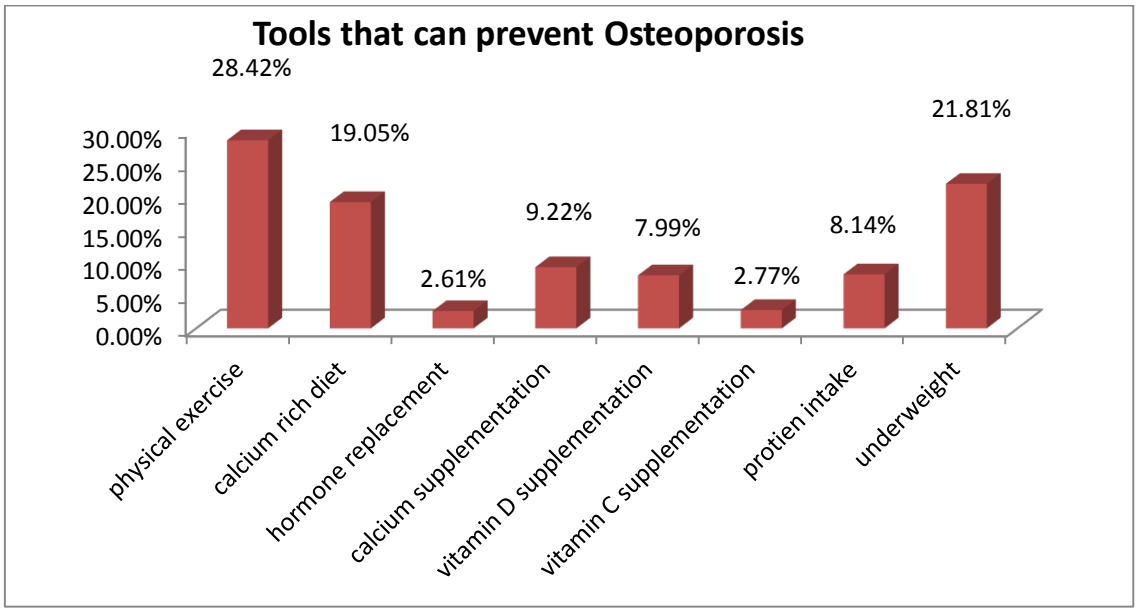


Figure 4.24: Knowledge about Tools that can prevent osteoporosis.

Among the populations majority (28%) thought that physical exercise is the main tool that can prevent osteoporosis and19% thought calcium rich diet can prevent osteoporosis.

4.25: Frequency of discussion about osteoporosis with family

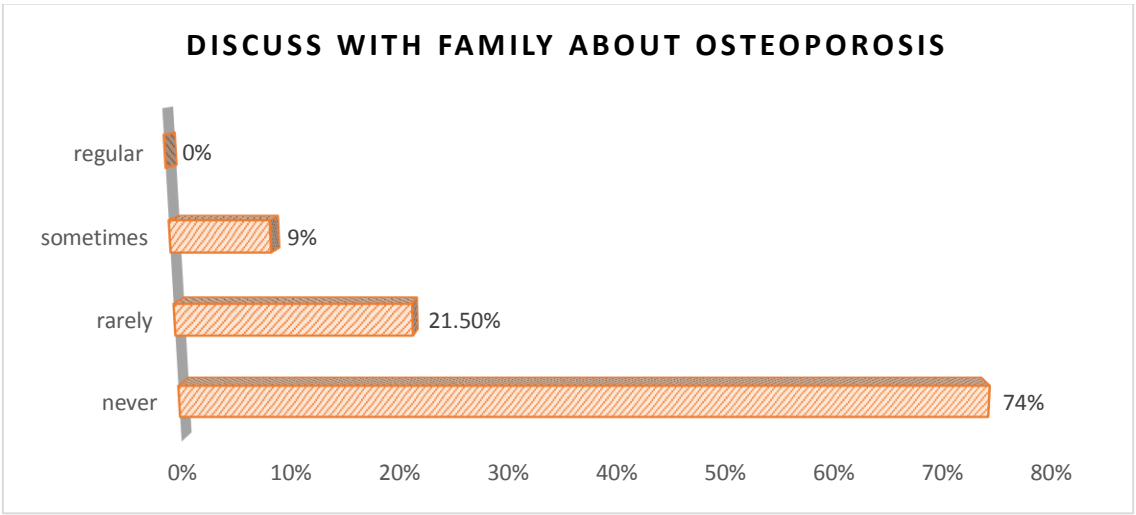


Figure 4.25: discussion about osteoporosis with family

Among the populations majority of them around 74% never discussed about osteoporosis with their families, only 21% discussed rarely.

4.26 Frequency of discussion about osteoporosis with health care professional?

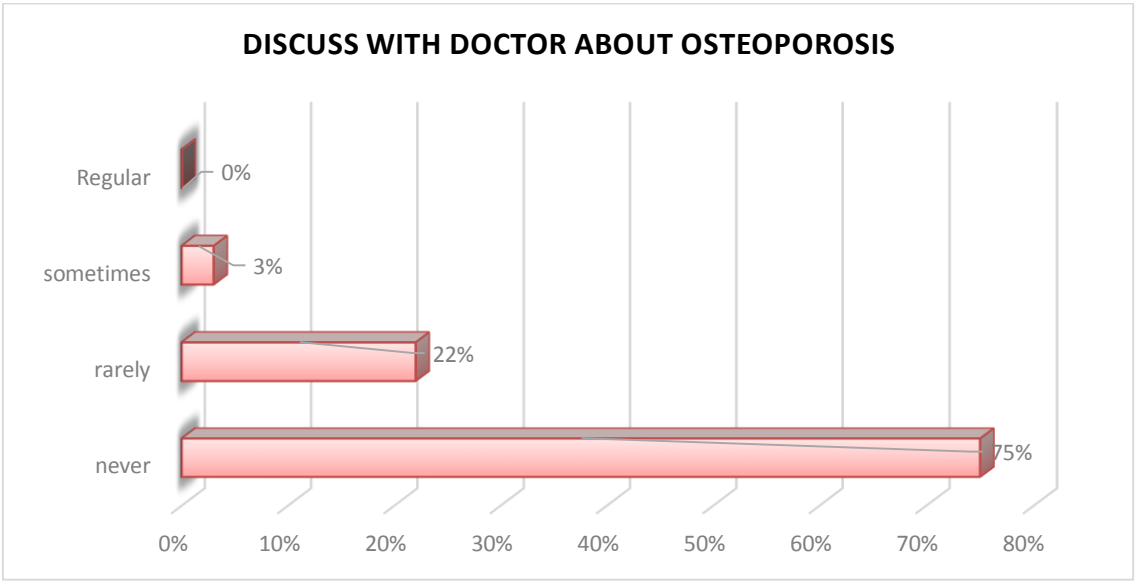


Figure 4.26: discussion about osteoporosis with health care professionals

Among the populations majority of them around 75% never discussed about osteoporosis with their doctors, only 22% discussed rarely.

4.27 Knowledge about diagnosis of osteoporosis

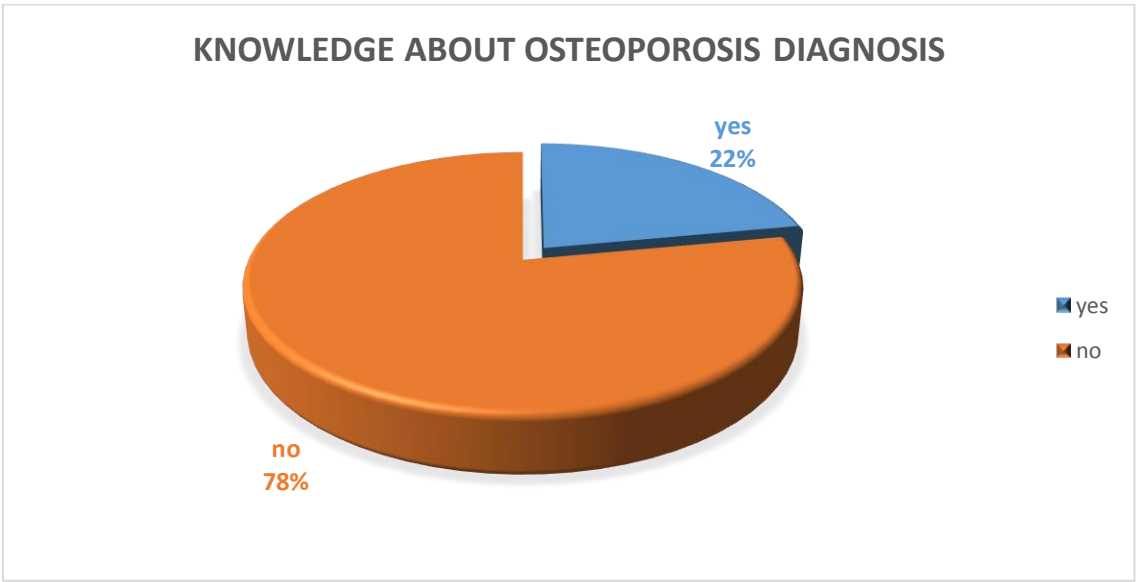


Figure 4.27: osteoporosis diagnosis knowledge

Among the populations 78% do not have any knowledge about how osteoporosis can be diagnosed.

4.28: Knowledge about Osteoporosis diagnosis process

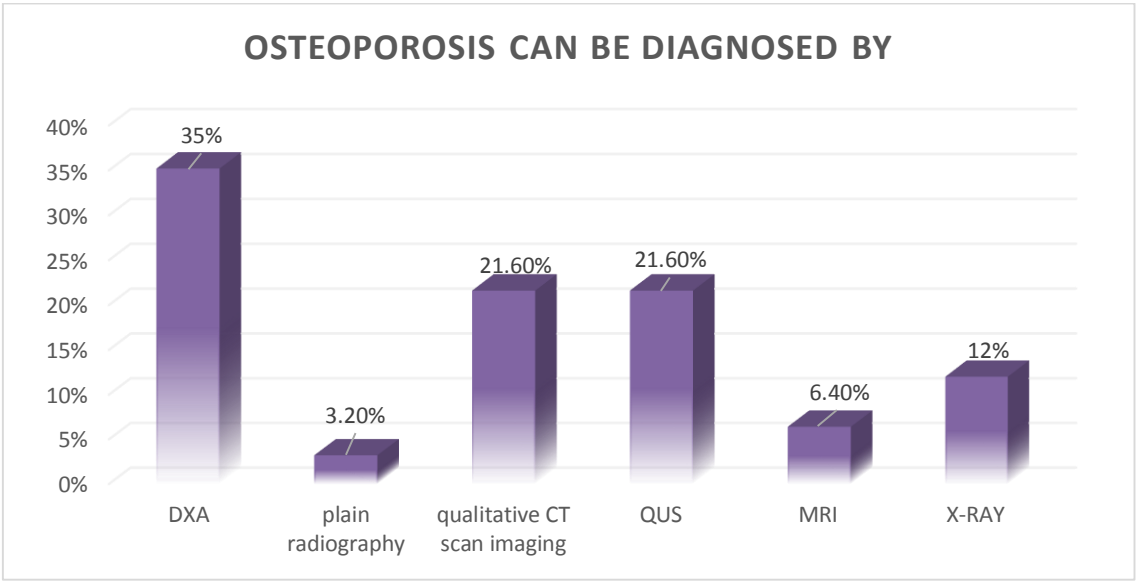


Figure 4.28: Knowledge about Osteoporosis diagnosis process

Among the populations 35% thought DXA is the diagnosis procedure for osteoporosis, 22% marked qualitative CT scan imaging & QUS and 12% think x-ray as the diagnosis procedure for osteoporosis.

CHAPTER 5

DISCUSSION

5. Discussion

This study was conducted to evaluate levels of awareness and their correlated determinants about risk factors, early warning signs, screening methods for early detection of osteoporosis in a large representative sample of general people below age 30. Osteoporosis is the most common of elderly people mostly women in Bangladesh. Its incidence in Bangladesh has risen significantly and is expected to continue to rise sharply through the years. The basic level of osteoporosis knowledge of the population about diagnostic tools, screening, new approaches to prevention, early diagnosis, and treatment modalities is important for controlling osteoporosis particularly in elderly women. Fractures are major risk factors of osteoporosis. Early detection of fractures plays the leading role in reducing development rates of osteoporosis and improving the patient's prognosis.

Among 200 participants all are educated where graduate level 49% and 49% completed college. Most of them are Students 98%, the participants are living with family (52%) and the rest of them don't live with family (48%).

Most of them are unaware of the basic knowledge of osteoporosis. 48% of all the subjects said that they had no knowledge about osteoporosis and 52% know what osteoporosis is where among the Indian women 74% know what osteoporosis is (Pande et al., 2005), women (mean age, 19.6 years) enrolled in a required undergraduate health course at a midwestern state university 90% heard about osteoporosis(Kasper, 1994). Even 91% did not know the types osteoporosis, 70% people do not know the risk factors of osteoporosis, 78% do not know the diagnosis procedure and 35% thought DXA is the diagnosis procedure for osteoporosis, 22% marked qualitative CT scan imaging & QUS and 12% think x-ray as the diagnosis procedure for osteoporosis.

Among 200 of participants 33% of participants have a family history of osteoporosis and the rest of 67% do not have that history. 28% having a maternal history of Osteoporosis and 72% are not having any maternal history of OP. 25% having a maternal history of fracture and 75% are not having any maternal history of fracture. In another research after adjustment for age, body mass index, history of cigarette smoking, thiazide use, and estrogen use, men and women with a family history of osteoporosis had lower BMD than those with a negative family history. Analysis of the effect of parental history of osteoporosis on BMD showed a significant relation between paternal (but not maternal) history and lumbar spine BMD in both sexes and a significant relation between maternal

(but not paternal) history and hip BMD only in men. The relative risk of having categoric osteopenia was highest in those whose fathers had a history of osteoporosis (RR 2.16, 95% CI = 1.38–3.37). A similar association was found for subjects with fractures. These results were not explained by differential awareness of family history in individuals with known osteoporosis, because the prevalence of family history was unrelated to personal history of osteoporosis in men and only weakly related in women. The positive predictive value of family history as an indicator of categorically defined low bone density was 22% in men and 24% in women, although in women this value increased to 33% when father's history alone was considered. The negative predictive value of overall family history was 65% in men and 81% in women. Overall, these data suggest that clinicians who ask patients about family history of osteoporosis should ask about both parents (Soroko et al., 2009).

It was seen in our study that among the participants 24% are concerned about getting osteoporosis and 76% are not concerned about osteoporosis and 65% believe that osteoporosis is more prone to female. Most women (79.1%) were concerned about developing osteoporosis but only 15.2% thought that osteoporosis was more serious than cancer. Community-based health education programs on osteoporosis that target a wide audience including the less well educated, could be implemented. Increasing the awareness of osteoporosis and its risk factors may be essential in efforts to decrease the incidence of this disease (Saw et al., 2003).

Around 46% thought calcium intake during adolescence and 48% thought calcium intake during childhood is the main factor that influence bone density. Majority the populations (28%) thought that physical exercise is the main tool that can prevent osteoporosis and 19% thought calcium rich diet can prevent osteoporosis and among the participant 39% is current smoker. In another survey author found female adolescents believed that physical inactivity, smoking, and inadequate calcium were health-risking behaviors and osteoporosis risk factors, however, specific in-depth knowledge regarding these risk factors was lacking. Findings further showed that health-risking behaviors were evident, as 25% were current smokers, 58% consumed less than the adequate intake for calcium, and 52% had scores that reflected low to moderate physical activity levels (Anderson et al., 2005).

Among the populations 53.21% picked up bone pain, 24.60% think loss of height, 20.32% think fatigue as the sign and symptoms of osteoporosis and only 1.8% picked up kyphosis and 98% thought bone pain as the major complication of osteoporosis.

Among the populations majority of them around 74% never discussed about osteoporosis with their families, only 21% discussed rarely.75% never discussed about osteoporosis with their doctors, only 22% discussed rarely.

In this survey among the participants 26% known about osteoporosis from health educator, 21% from doctors, 12% from electronic media, 15% from friends and family and 15% from published media and so on. Where in Indian women media (74%) was the commonest source of knowledge followed by friends (49%) and doctors (25%) (Pande et al., 2005).

Most of the participant had selected age as the uncontrollable risk factor among all the others. Among the populations most of them round 81% do not have any idea about the disorders that affect the skeleton. It was seen that most of the patients do not have any idea about the medical treatment that can affect the bone health. Among all the patients 14% thought that alcohol is the controllable risk factor for osteoporosis, 12% thought smoking direct and 14% don't have any idea about the controllable risk factors. .

Prevalence of risk factors other than age were < 20%, except for senescence (38%) and alcohol use (40%) (Juby and Davis, 2001).

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THE END