

# **OSTEOPOROSIS**

## **Introduction:**

Osteoporosis is a chronic progressive metabolic bone disease characterized by the loss of the normal density of bone, resulting in fragile bone. Osteoporosis causes bones to become weak and brittle that a fall or even mild stresses such as bending over, or coughing can cause a break.

Osteoporosis is an age-related metabolic disease literally means porous bone in which the bone mineral density is reduced. It occurs when bone loss excessive amount of their protein and mineral content, particularly calcium.

Bone demineralization result in the loss of bone mass, leading to fragile and porous bone and subsequent fracture. It occurs when rate of bone resorption exceeds the rate of bone formation.

According to National Osteoporosis Foundation osteoporosis is defined as “a disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to bone fragility and an increased susceptibility to fractures.”

## **Risk factors of osteoporosis:**

### **1. Non modifiable risk factors**

#### **a. Age:**

Advanced age, Postmenopausal women, Low testosterone in male and decreased calcitonin, the peak bone mass is gradually decrease predispose to loss bone mass. Osteoporosis is more in female after 50 and after 70 in male.

#### **b. Sex:**

With the onset of menopause, diminishing estrogen levels lead to excessive bone resorption. So, the risk of osteoporosis is 8<sup>th</sup> times more common in women than in men.

#### **c. Genetics:**

- White or Asian ethnicity
- Heredity and Family history

The heritability of fracture as well as low bone mineral density is relatively high (60% - 80%).

-Body Type

Small bones and thin frames/Small stature is a non-modifiable risk factor associated with the development of osteoporosis.

## **2. Modifiable risk factors**

a. Nutrition:

-Low calcium intake, vitamin D deficiency, high phosphate (carbonated beverages) intake reduces nutrients needed for bone remodeling.

-Caffeine, excess alcohol intake, tobacco smoking increase cortisol in blood leading to increase bone loss.

b. Physical Inactivity:

Bones need stress for bone maintenance. Bone remodeling occurs in response to physical stress or exercise. So, sedentary lifestyle, lack of weight bearing exercise, low weight and body mass index can lead to significant bone loss.

c. Medications and Co-morbidity:

Corticosteroids, anti-seizure medication, heparin, thyroid hormone, and co-morbidity (presence of one or more disorder); anorexia nervosa, hyperthyroidism, Cushing's disease (excess endogenous glucocorticoid), malabsorption, renal failure affect calcium absorption and metabolism.

### **MNEMONIC to recall risk factors.**

A; alcohol use

C; corticosteroid use

C; calcium low

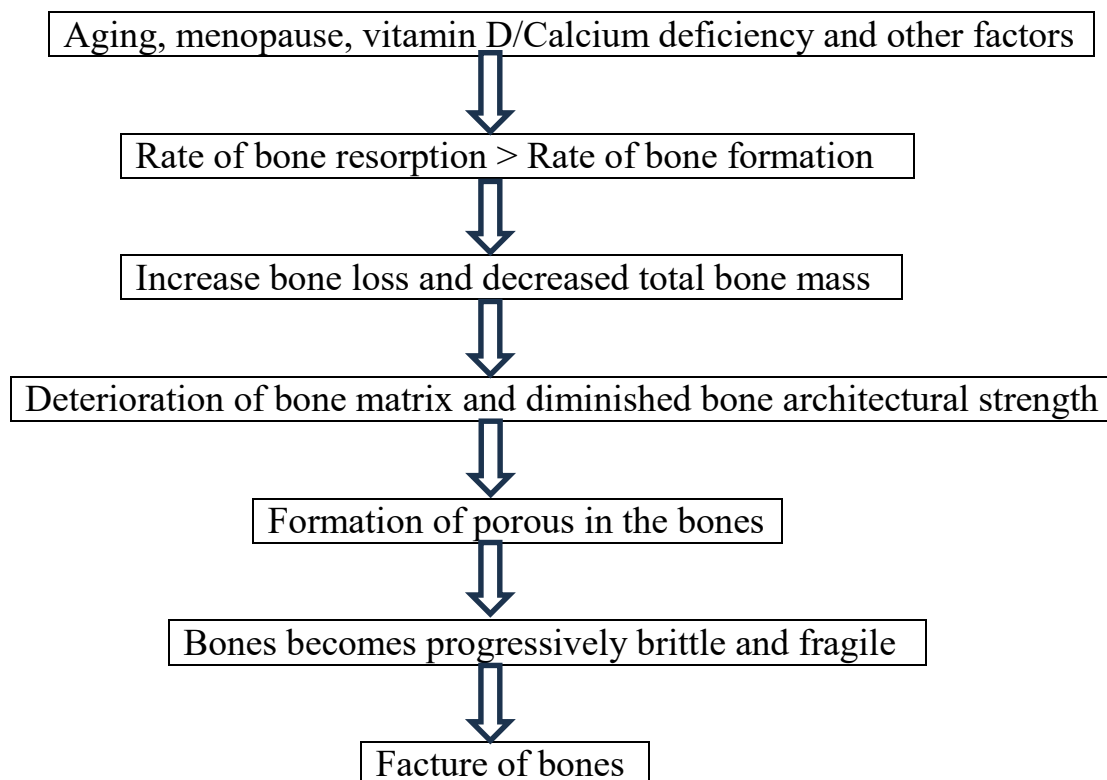
E; estrogen low

S; smoking

S; sedentary lifestyle

**(ACCESS LEADS TO OSTOPOROSIS)**

### Pathophysiology of osteoporosis:



### Sign and symptoms of Osteoporosis:

Osteoporosis usually has no sign or symptoms until a fracture happens. That's why osteoporosis has been called the “**silent disease**”.

- ✓ Thin/weak or fragile and Brittle bones
- ✓ Fracture of bone (break easily, even sneeze or minor fall that won't normally cause fracture) or Pathological Fractures. Wrists, spine, and hips are the most common sites of fracture.
- ✓ Compression fracture of spine
- ✓ Persistent unexplained back pain
- ✓ Bone loss in mandible; loss of teeth or poorly fitted teeth, changes in appearance.
- ✓ Changes in height (Loss of height)
- ✓ Dowager's hump (kyphosis)

### Diagnosis for Osteoporosis:

- a) History taking:  
Family history, dietary habit, physical activity, and lifestyle.

- b) Complete physical examination:  
Appearance of back, loose tooth and loss of height on examination.
- c) Bone X-ray, CT scan:  
Reveals injury and decreased bone mass (x-ray show changes only after 30% to 60% loss of bone).
- d) Dual energy x-ray absorptiometry (DEXA or DXA) scan:  
Considered Gold standard and means of measuring bone mineral density (BMD) by x-ray beams. Its results are reported as T-scores which is the number of standard deviations below average for normal bone density.
- Bone mineral density: -Normal score; -1 to 1 S.D
- Low bone mass; -1 to -2.5 S.D
- Osteoporosis; -2.5 or lower S.D.
- e) Blood and urine test:  
Serum calcium level, alkaline phosphate may be normal in osteoporosis.  
Calcium excretion in urine may be seen.

### **Management of Osteoporosis:**

The goals of osteoporosis treatment are to:

- Control pain
  - Slow down or stop bone loss.
  - Prevent bone fractures with medicines that strengthen bone.
  - Minimize the risk of falls that might cause fractures.
1. Diet
- A rich diet in calcium and vitamin D throughout life, with an increased calcium intake during adolescence and middle years protects against skeletal demineralization.
  - The recommended adequate intake level of calcium for men 50 to 70 years is 1000mg daily, and for women aged 51 and older and men aged 71 and older is 1200 mg daily.
  - The recommended vitamin D intake for adults up to 70 years of age is 600 IU, and 800 IU daily for over the age of 70.
  - Quit smoking and caffeine and alcohol intake should be avoided.

## 2. Exercise

- Regular weight bearing exercise in which bones and muscle works against gravity are best such as walking, jogging, playing tennis, dancing.
- Resistance exercise like stretch bands.
- Balance exercise like yoga.
- Riding bicycles
- Try to increase exercise 3-4 times per weeks for 20-30 minutes per day.

## 3. Prevent Fracture

- Avoid sedating medication.
- Make sure patient vision is good.
- Remove household hazards and wear well fitted shoes to prevent fall.
- Bracing, prophylactic bracing of spine to prevent pathological fracture in a severely osteoporotic spine.

## 4. Medication

- Analgesics: e.g. ibuprofen acetaminophens, narcotics to reduce pain.
- Bisphosphonates: e.g. alendronate, ibandronate  
Leading drugs for osteoporosis supposed to reduce postmenopausal bone loss, reduce risk of osteoporotic vertebral fracture, and prevent and treat corticosteroid induced osteoporosis and should be taken on empty stomach with plain water avoiding food for 45-60 minutes.
- Calcitonin:  
A synthetic thyroid hormone usually prescribes as a daily nasal spray to reduce factors that cause loss of calcium and increase reabsorption of calcium in the GI tract.
- To ensure adequate calcium intake, a calcium supplement (e.g., Caltrate, Citracal) with vitamin D may be prescribed.
- Selective Estrogen Receptor Modulators (SERMs): Raloxifene
- Hormone Replacement Therapy: estrogen in combination with progestin.

## 5. Monitoring

- Response to treatment can be monitored with a series of bone mineral density measurements taken every 1-2 years.
- Women taking estrogen should have routine mammograms, pelvic exams, and pap smear.

## 6. Surgical treatment

- Percutaneous vertebroplasty:

-Vertebroplasty is a minimally invasive, image-guided therapy used to relieve pain from a vertebral body fracture. It has been used for osteoporotic or malignant fractures.

-Percutaneous vertebroplasty (PVP) usually involves percutaneous injection of cement, polymethylmethacrylate (PMMA), into the vertebral bodies.

- Kyphoplasty:

-Kyphoplasty is a surgical procedure that expands and stabilizes compression fractures of the spine. It is a type of vertebral augmentation surgery.

-During kyphoplasty balloon device is introduced into the spine and inflated to expand the bone.

-The cavity created by the balloon is then filled with a bone cement mixture.

-When this process is completed, an internal cast is formed inside the vertebral body with the goal of reducing pain, stabilizing a damaged area and/or restoring lost height in the vertebral body.

## **Nursing Management of Osteoporosis:**

### **Assessment**

- History taking which includes question concerning the:

- occurrence of osteoporosis,

- focus on family history,

- previous fractures,

- dietary consumption,

- exercise pattern,

- onset of menopause and

- use of medicines as well as alcohol, smoking, and caffeine intake.

- Assess for any symptoms the patient is experiencing, such as, backpain, constipation, fractures, altered body images.
- Physical examination may disclose kyphosis, fractures, or shortened stature.
- Assess for problems in mobility and breathing because of changes in postures and weakened muscles.
- Assess for severity of osteoporosis via diagnostic procedures.

### **Nursing diagnosis**

Based on assessment data, the major nursing diagnosis for the patient who experiences a spontaneous vertebral fractures related to osteoporosis may include:

- Acute pain related to fracture and muscle spasm.
- Risk for constipation related to immobility and development of ileus.
- Deficient knowledge about the osteoporotic process and treatment regimen.
- Risk for injury; additional fractures related to osteoporosis.

### **Planning and goals**

The major goals for the patient may include relief of pain, knowledge about osteoporosis and the treatment regimen, improved bowel elimination and absence of additional fractures.

### **Nursing intervention**

- Relieving pain
  - Short periods of resting in bed in a supine or side lying position.
  - Use firm non sagging mattress and knee flexion increases comfort by relaxing back muscles.
  - Providing analgesics to reduce pain.

- Improving bowel Elimination.

Constipation is a problem related to immobility and medications.

-Encourage for high fiber diet, increase fluid and tolerable ambulation or exercise.

-If vertebrae collapse involves the T10-T12 vertebrae, patient may develop a paralytic ileus thus monitor patient's intake, bowel sound and bowel activity.

-Use prescribed stool softeners help, prevent, or minimize constipation.

- Promote understanding of osteoporosis and the treatment regimen.

-Provide teaching focusing on factors influencing the development of osteoporosis, intervention to slow the process and measures to relief symptoms.

-Emphasize on continuing to need of sufficient calcium, vit D and weight bearing exercise to slow progress of osteoporosis.

-Provide information related to pharmacological therapy as prescribed.

- Preventing injury.

-Physical activity is essential to strengthen muscles, improve balance, prevent disuse atrophy, and retard progressive bone mineralization.

-Isometric exercise can strengthen trunk muscles.

-Encourage for walking, good body techniques and good postures.

-Avoid sudden bending, jarring and strenuous lifting.

## **Evaluation**

- Achieves Pain Relief.

-Experiences pain relief at rest.

-Experiences minimal discomfort during ADLs.



-Demonstrate diminished tenderness of fracture site.

- Demonstrate normal bowel elimination.

-Has active bowel sound.

-Reports regular pattern of bowel movement.

- Acquire knowledge about osteoporosis and the treatment regimen.

-States relationship of calcium and vit D intake and exercise to bone mass.

-Increase level of exercise.

-Consume adequate dietary and prescribed medication.

- Experiences no new fractures.

-Maintain good posture.

-Uses good body mechanics.

-Consume diet high in calcium and vitamin D.

-Engage in weight bearing exercises (like walking).

-Participate in outdoor activity.

-Accept assistance and supervision as need.

### **Prevention of Osteoporosis:**

- Eat healthy diet with plenty of calcium.
- Take calcium and vitamin D supplement as needed.
- Get regular exercise.
- Try not to fall or prevent injury.
- Quit smoking and limit alcohol consumption.