

# 2-osteoporosis and vitamin D deficiency

## **Objectives:**

**1-Definition of Osteopenia and Osteoporosis.**

**2-Clinical Features.**

**3-Risk Factors.**

**4-Approach (history, physical examination, investigation “how to interpret DEXA scan”, Updated management).**

**5-How to Interpret Vitamin D Results (Nanomol/Nanogram).**



## Definitions

### ■ **Osteoporosis:**

A chronic, progressive disease characterized by low bone mass, microarchitecture deterioration of bone tissue, bone fragility, and a consequent increase in fracture risk.

### ■ **Osteopenia:**

Think of it as a midpoint between having healthy bones and having osteoporosis.

Osteopenia is when your bones are weaker than normal but not so far gone that they break easily, which is the hallmark of osteoporosis.

## Clinical Features

Osteoporosis is often referred to as the “silent disease” as bone loss is gradual and painless, and there are usually no symptoms to indicate a person is developing osteoporosis. Most commonly, osteoporotic fractures occur at the spine, the wrist or the hip, although osteoporotic fractures can occur in other bones as well.

## Risk factors

- ⇒ Excessive alcohol intake, caffeine intake and tobacco use (any types of smoking)
- ⇒ Family history of osteoporotic fracture
- ⇒ Gonadal hormone deficiency
- ⇒ Immobilization and inadequate activity
- ⇒ Increasing age.
- ⇒ Low body weight (< 58 kg [128 lb])
- ⇒ Low calcium or vitamin D intake
- ⇒ Low level of physical activity
- ⇒ Personal history of fracture
- ⇒ White or Asian race

**History:**

The presentations of osteoporosis are asymptomatic until the fracture happens, so the clinical diagnosis of osteoporosis is based on presence history of the risk factors and previous low force fragility fracture

**Physical Examination:**

We have 4 main steps for examination: look, feel, move and special test, and it depends on the patient presentation, if it's a fracture then there is decrease in the range of motion, tenderness, swelling and sometimes deformities. And nothing significant in examination except that low BMI or spinal kyphosis due to asymptomatic fracture may present. Assessment of vision, balance, gait and lower limb power are important to prevent the risk of fall and fracture.

**Investigations:****A- Screening:**

According to toward optimized practice

**1 -General population with no known risk factors (50-64 years old):**

-Using the Osteoporosis Self-assessment tool (OST): Weight (kg) – Age (years) which is considered an easy and effective method to identify patients at risk for osteoporosis. If the score more than 10 is considered the low risk of osteoporosis .

-A bone mineral density (BMD) test is required to order only if OST score is <10 which is moderate to high-risk of osteoporosis .

-Reassess OST every 5 years.

**2 -Patients with known risk factors:**

Perform BMD test for men and women above the age of 50 and with one or more of the following risk factors:

-Risk of future fractures and fragility fracture after the age of 40.

-Vertebral compression fracture or osteopenia identified on radiography

-Parental hip fracture

-Prolonged use of glucocorticoids

-Use of other high-risk medications

-Rheumatoid arthritis, malabsorption syndrome, other disorders strongly associated with osteoporosis.

-Current smoker

-High alcohol intake (>3 units/day)

- Major weight loss (10% below their body weight at age 25)

## B-Diagnosis:

### 1-Imaging:

BMD measurement by using DEXA scan is considered the gold standard test for diagnosis of osteoporosis. Normal DEXA scan when T score more than -1. If T score is -2.5 or less indicates osteoporosis while if T score -2.5 less with fragility fracture implies severe osteoporosis. Osteopenia is also reduced in bone mass with less severe than osteoporosis (T score between -1 and -2.5)

-Using quantitative ultrasound (QUS) of the heel if DEXA is unavailable.

-Quantitative CT could be done to measure trabecular bone density if DEXA is unavailable.

### 2-Labrotary test:

-Biochemical: elevated urinary deoxypyridinoline and N-telopeptides; low serum procollagen type I N-propeptide and elevated serum C-terminal telopeptide of type I collagen.

-Other: Normal except the albumin could be decreased and serum PTH may be increased.

## Management:

### Who to Treat?

The National Osteoporosis Foundation recommends treatment of postmenopausal women and men with a personal history of hip or vertebral fracture, a T-score of -2.5 or less, or a combination of low bone mass (T-score between -1 and -2.5) and a 10-year probability of hip fracture of at least 3% or any major fracture of at least 20% as calculated by the FRAX Fracture Risk Assessment Tool.

### Nonpharmacological Treatment:

- Alcohol moderation  $\leq 4$  drinks per day for men or  $\leq 2$  drinks per day for women
- Decreased caffeine intake  $\leq 2.5$  cups of coffee or  $\leq 5$  cups of tea per day
- Multicomponent exercise with strength and balance training
- Smoking cessation
- Sunlight/ultraviolet exposure 30 minutes per day, 5 days per week

### Pharmacological Treatment:

- **calcium and vitamin D (first line).**
- **Bisphosphonates:**
  - o inhibits osteoclast activities (like sodium alendronate)
  - **Side effects:**
    - Gastrointestinal upset
    - Osteonecrosis of the jaw and atypical femoral fractures are rare complications of bisphosphonate therapy that are associated with longer duration of use. Clinicians should consider discontinuing bisphosphonate therapy after five years in women without a personal history of vertebral fractures.
- **Denosumab**
  - o It appears to be a reasonable alternative for persons whose condition does not improve with bisphosphonates.
  - o Renal insufficiency is a listed caution

## How to interpret vitamin d results (nanomole/nanogram)

### Definition :

The National Academy of Medicine considers a serum 25-hydroxyvitamin D (25-OH-D) level of 12 to 20 ng per mL (30 to 50 nmol per L) as the normal range for adequate exposure to vitamin D to maintain bone health. Individuals with levels less than 12 ng per mL will usually be deficient, and 97.5% of individuals with a serum level higher than 20 ng per mL have adequate vitamin D exposure.

### Vitamin D Deficiency Diagnosis :

The most accurate way to measure how much vitamin D is in your body is the 25-hydroxy vitamin D blood test. A level of 20 nanograms/milliliter to 50 ng/mL is considered adequate for healthy people. A level less than 12 ng/mL indicates vitamin D deficiency

**1 ng/mL = 2.5 nmol/L**