* Objectives

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**Osteoporosis**

1. Definition of Osteoporosis and Osteomalacia / Rickets
2. Highlight on Vitamin D deficiency
3. Prevalence in world / Saudi Arabia
4. Factors lead to Osteoporosis and Vitamin D deficiency
5. How patients could be presented
6. Common fractures with osteoporosis
7. Vitamin D and Comorbidities
8. Osteoporosis management:
9. **Definition of osteoporosis:**

Disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. (Normal mineralization)

Or

A skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture.

* **Rickets**: Deficient mineralization of bone and cartilage that occurs BEFORE closure of growth plates.
* **Osteomalacia:** Deficient mineralization of bone that occurs AFTER closure of growth plates.

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| --- | --- |
| **Condition** | **Level** |
| Normal | 30 – 100 ng/mL  75 - <250 nmol/L |
| Insufficient | >20 - <30 ng/mL  >50 – <75 nmol/L |
| Deficiency | >10 - <20 ng/mL  >25 – <50 nmol/L |
| Severe deficiency | <10 ng/mL  <25 nmol/L |

1. **Highlight on Vitamin D deficiency:**

* Difficulty thinking clearly
* Bone pain
* Frequent bone fractures
* Muscle weakness
* Soft bones that may result in deformities
* Unexplained fatigue
* Psoriasis

1. **Prevalence in world / Saudi Arabia:**

Basmah K et al. reported that approximately 34% of healthy Saudi women, and 30.7% of men, 50-79 years of age are osteoporotic.

1. **Factors lead to Osteoporosis and Vitamin D deficiency**

**Non-modifiable:** Age (Most important risk factor), Female gender, Menopause, Family history, Small frame m History of broken bones.

**Modifiable:** Low Ca/Vitamin D, Sedentary lifestyle, Smoking, Alcohol use, low body weight.

**Medical diseases:** Premature menopause, Malabsorption, Chronic liver disease, IBD.

**Medication:** Steroids, L-Thyroxine, Phenytoin,Barbiturates, Thiazolidinediones, Chronic Lithium use.

1. **How patients could be presented:**

**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. (1)

**Examination** :

Nothing significant in examination except that low BMI or spinal kyphosis due to asymptomatic fracture may present.

Assesment of vision, balance, gait and lower limb power are important to prevent the risk of fall and fracture. (1)

**Investigation**

**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 od 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) (2)

**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 from -1 to less than -2.5)

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

-Quantitative CT could be done to measure trabecular bone density if DXA 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

1. **Common fractures with osteoporosis**

1-Hip fracture

2-Wrist fracture

3-femoral fractures are associated with long-term therapy of bisphosphonate.

4-Vertebral fractures

1. **Vitamin D and Comorbidities**

**Causes of Vitamin D deficiency :**

1-Avoid the exposure to sunlight: the sun is considered the main source of Vitamin D

2-The sun screening action of melanin because of increased in pigmentation reducing the vitamin D production in the skin.

3-Ageing is associated to reduce the ability of production vitamin D decreases.

4-Inadequate dietary of vitamin D intake.

5-Infants that their nutrition only from breast milk

6-Intestinal Malabsorption syndrome (coeliac disease, cystic fibrosis, Crohn's disease, Whipple's disease, or short bowel syndrome and gastric bypass surgery) (5 with all above )

7- Rarely Vitamin D deficiency-like syndrome can occur as a result of several inherited disorders that either reduce or prevent the metabolism of 25-hydroxyvitamin D to 1,25-dihydroxy vitamin D.

8-Glucocorticoids, antiepileptic medication, highly active antiretroviral therapy (HAART), rifampicin, and St John's wort may also result in vitamin D deficiency owing to activation of the steroid and xenobiotic receptors, which results in activation of the enzymatic machinery destroying 25-hydroxy vitamin D and 1,25-dihydroxy vitamin D.

1. **Osteoporosis management:**

* Sub-objectives

1. Prevent fractures
2. Increase bone density and mineralization
3. Improve quality of life
4. Prevent further falls
5. **Prevent fractures**

* Nutrition: calcium and vitamin D
* Physical Activity
* Other lifestyle factors: Smoking cessation

1. **Increase bone density and mineralization “Pharmacological”**

* Bisphosphonates “Aledronate[[1]](#footnote-1)”
* Denosumab
* Selective estrogen receptor modulator such as “Raloxifine”
* Parathyroid hormone “Teriparatide[[2]](#footnote-2)”
* Calcitonin

1. **Surgical therapy**

* Vertebroplasy and Kyphoplasty

1. **Osteoporosis Guidelines**

* The National Osteoporosis Foundation (NOF) recommends that pharmacologic therapy should be reserved for postmenopausal women and men aged 50 years or older who present with the following:

1. A hip or vertebral fracture vertebral fractures may be clinical or morphometric.
2. T-score of –2.5 or less at the femoral neck or spine after appropriate evaluation to exclude secondary causes.
3. Low bone mass (T-score between –1.0 and –2.5 at the femoral neck or spine) and a 10-year probability of a hip fracture of 3% or greater or a 10-year probability of a major osteoporosis-related fracture of 20% or greater based on the US-adapted WHO algorithm.

* Guidelines from the American Association of Clinical Endocrinologists (AACE), published in 2010, include the following recommendations for choosing drugs to treat osteoporosis:
* First-line agents: alendronate, risedronate, zoledronic acid, denosumab
* Second-line agent: ibandronate
* Second- or third-line agent: raloxifene
* Last-line agent: calcitonin
* Treatment for patients with very high fracture risk or in whom bisphosphonate therapy has failed: teriparatide

**Long-term monitoring:**

* The US Preventive Services Task Force 2011 recommendations state that evidence is lacking regarding optimal intervals for repeated screening by dual-energy x-ray absorptiometry (DXA) for individuals with osteoporosis, as well as regarding whether a woman with a normal BMD requires repeated screening.
* The USPSTF noted that, “a minimum of 2 years may be needed to reliably measure a change in BMD; however, longer intervals may be necessary to improve fracture risk prediction.”
* According to a study funded by the National Institutes of Health, osteoporosis will develop in fewer than 10% of older, postmenopausal women during the following rescreening intervals:
* Women with normal BMD or mild osteopenia - Approximately 15 years
* Women with moderate osteopenia - Approximately 5 years
* Women with advanced osteopenia - Approximately 1 year

**Pregnancy and vitamin D**

* Vitamin D deficiency and insufficiency are common across the globe. Large epidemiological studies reveal the high prevalence of vitamin D in women, including antenatal and lactating mothers.
* Randomized controlled trials are available to support the need for, and benefits of, vitamin D supplementation in pregnancy.
* Newer data proves the safety and efficacy of 4000 IU vitamin D, administered daily over 6 months of pregnancy.
* It has not however, found any correlation between maternal vitamin D and birth weight.
* In a 2016 Cochrane review including data from seven small trials, pregnant women who received daily vitamin D supplementation had higher 25-hydroxyvitamin D levels than those receiving placebo, but the response was heterogeneous

BEST OF LUCK!

1. Doctor mentioned that this is the most important drug, it MUST be administrated with a full cup of water, and the patient has to stay for at least 30 min awake. [↑](#footnote-ref-1)
2. Given if Bisphosphonates did not work. [↑](#footnote-ref-2)