NGN NCLEX 2026 | NUTRITION · ENDOCRINE · MUSCULOSKELETAL | PATIENT EDUCATION

# Foods High in Calcium & Vitamin D

The Bone-Building Power Couple — Dietary Sources, Absorption, & NCLEX High-Yield Pearls

## 1 Definition & Why It Matters

THE FOUNDATION OF BONE & CELLULAR HEALTH

### Calcium ($Ca^{2+}$)

- **99%** stored in bones & teeth
- Drives **muscle contraction**, **nerve transmission**, & **blood clotting**
- Normal serum: **8.6–10.2 mg/dL**

### Vitamin D (Calciferol)

- The **"Sunshine Vitamin"** — fat-soluble
- **Required** for calcium absorption in the small intestine
- Normal serum 25-OH-D: **30–100 ng/mL**

🔑 **KEY CONCEPT:** Calcium and Vitamin D work as a **team**. Without adequate Vitamin D, calcium cannot be absorbed — even with a calcium-rich diet, the patient remains deficient.

# 2 Pathophysiology — The Calcium-Vitamin D Axis

FROM SUNLIGHT TO STRONG BONES

### VITAMIN D ACTIVATION PATHWAY

☀️ UV light hits skin → Cholecalciferol ($D_3$) formed → 🫀 Liver: 25-OH-D → 🫘 Kidney: **Calcitriol** (active)

### WHEN CALCIUM IS LOW (Hypocalcemia)

↓ Serum $Ca^{2+}$ → Parathyroid releases **PTH** → Pulls $Ca^{2+}$ from bones → 🦴 **Osteoporosis & fractures**

⚠️ **CLINICAL PEARL:** Patients with **chronic kidney disease (CKD)** cannot activate Vitamin D (no calcitriol). They need **active-form Vit D (calcitriol/Rocaltrol)**, not regular cholecalciferol.

# 3 Signs & Symptoms of Deficiency

EARLY VS. LATE · RED FLAG FINDINGS

## 🟡 EARLY / MILD

- Numbness & tingling (perioral, fingertips)
- Muscle cramps, twitches
- Fatigue, mood changes, depression
- Brittle nails, dry skin
- Bone & muscle aches

## 🔴 LATE / SEVERE

- 🚨 **Tetany** — sustained muscle contraction
- 🚨 **Trousseau's sign** (carpal spasm w/ BP cuff)
- 🚨 **Chvostek's sign** (facial twitch w/ tap)
- 🚨 **Cardiac dysrhythmias** · prolonged QT
- 🚨 **Seizures** · laryngospasm
- 🚨 **Pathological fractures** (osteoporosis)

## 👧 Vit D Deficiency in CHILDREN

- **Rickets** — soft, weak bones
- **Bowed legs**, delayed growth
- Delayed teething, dental issues
- Frequent fractures

## 👵 Vit D Deficiency in ADULTS

- **Osteomalacia** — softening of bones
- Bone pain (especially pelvis, ribs, legs)
- Proximal muscle weakness → falls
- **Osteoporosis** in older adults

# 4 Foods HIGH in CALCIUM 🥛

BEST DIETARY SOURCES — MEMORIZE THESE

**Adult RDA:** **1,000–1,200 mg/day** | **Postmenopausal/Older Adults:** 1,200 mg/day | **Max absorption:** 500–600 mg per dose

## 🥛 DAIRY (Highest & Best Absorbed)

**Milk (1 cup)**
300 mg

**Cheddar cheese (1 oz)**
200 mg

**Yogurt (8 oz)**
300–450 mg

**Cottage cheese (1 cup)**
140 mg

## 🌿 PLANT-BASED & LEAFY GREENS

**Kale (1 cup cooked)**
95 mg

**Broccoli (1 cup)**
60 mg

**Collard greens (1 cup)**
265 mg

**Bok choy (1 cup)**
160 mg

**White beans (1 cup)**
160 mg

**Almonds (1 oz)**
75 mg

**Tofu (½ cup, calcium-set)**
250–350 mg

**Sesame seeds (¼ cup)**
350 mg

## 🐟 FISH & FORTIFIED

🐟

**Sardines w/ bones (3 oz)**

325 mg

🍣

**Canned salmon w/ bones**

180 mg

🍊

**Fortified OJ (1 cup)**

300 mg

🥣

**Fortified cereal (1 cup)**

100–1000 mg

# 5 Foods HIGH in VITAMIN D ☀️

THE "SUN-FISH-EGGS-FORTIFIED" FOODS

**Adult RDA:** **600–800 IU/day** (15–20 mcg) | **Adults >70:** 800 IU/day | **Upper limit:** 4,000 IU/day

## 🐟 FATTY FISH (Highest Natural Sources)

**Salmon (3 oz)**
450 IU ⭐

**Mackerel (3 oz)**
390 IU

**Tuna, canned (3 oz)**
230 IU

**Sardines (3 oz)**
165 IU

## 🥚 OTHER NATURAL SOURCES

**Cod liver oil (1 tbsp)**
1,360 IU ⭐⭐

**Egg yolk (1 large)**
40 IU

**Mushrooms (UV-treated)**
400 IU

**Beef liver (3 oz)**
42 IU

## 🥛 FORTIFIED FOODS (Most Common Source in US)

**Fortified milk (1 cup)**
115–120 IU

**Fortified OJ (1 cup)**
100 IU

**Fortified cereal**
40–100 IU

**Soy/almond milk fortified**
100–144 IU

☀️ **THE SUN FACTOR:** 15–20 minutes of **face/arms sun exposure** 2–3×/week produces ~10,000–25,000 IU. **Sunscreen SPF 8+ blocks 95%** of UV-B → reduces Vit D synthesis. Darker skin needs **3–6× longer** exposure.

# 6 Priority Nursing Interventions

ABCS · SAFETY · ASSESSMENT · EDUCATION

## 🔍 ASSESS

- ✓ Dietary intake (24-hr recall)
- ✓ Sun exposure habits
- ✓ Lab values: $Ca^{2+}$, 25-OH Vit D, phosphate, PTH, albumin
- ✓ Risk factors: age, dark skin, veiled clothing, GI malabsorption, CKD, liver disease
- ✓ Med history (steroids, anticonvulsants, PPIs deplete Ca/Vit D)
- ✓ Trousseau's & Chvostek's signs

## 🛡️ SAFETY (Priority!)

- 🚨 Fall precautions — osteoporotic bones break easily
- 🚨 Cardiac monitoring with severe hypocalcemia
- 🚨 Seizure precautions (severe deficiency)
- 🚨 Have **IV calcium gluconate** ready for tetany

## 💊 ADMINISTER

- ✓ Calcium & Vit D supplements as ordered
- ✓ Calcium **carbonate** WITH meals (needs acid)
- ✓ Calcium **citrate** with or without food
- ✓ Split doses — max 500–600 mg absorbed/dose
- ✓ Separate from **iron, levothyroxine, tetracyclines** by 2+ hrs

## 📚 TEACH & PROMOTE

- ✓ Weight-bearing exercise (walking, resistance)
- ✓ 15–20 min sun exposure to face/arms
- ✓ Limit caffeine, alcohol, sodium (↑ Ca loss)
- ✓ Smoking cessation (↓ bone density)
- ✓ Lactose intolerant → fortified plant milks, hard cheeses, yogurt

# 7 Pharmacology

SUPPLEMENTS & BONE-HEALTH MEDICATIONS

| DRUG / CLASS | MECHANISM | SIDE EFFECTS | NURSING CONSIDERATIONS |
|---|---|---|---|
| **Calcium Carbonate (Tums, Os-Cal)** | Provides 40% elemental $Ca^{2+}$; needs gastric acid for absorption | Constipation, gas, kidney stones, hypercalcemia | Give **WITH meals**; ↑ fiber/water; avoid w/ PPIs |
| **Calcium Citrate (Citracal)** | 21% elemental $Ca^{2+}$; absorbed without acid | Constipation (less than carbonate) | Give **with or without food**; preferred for older adults & PPI users |
| **Cholecalciferol (Vit $D_3$)** | Inactive form; converted by liver/kidneys | Hypercalcemia (toxicity), nausea, weakness | Take with fatty meal (fat-soluble); monitor 25-OH-D level |
| **Calcitriol (Rocaltrol)** | **ACTIVE** form of Vit D — bypasses kidney activation | Hypercalcemia, hypercalciuria, kidney stones | **Drug of choice for CKD/dialysis pts**; monitor Ca closely |
| **Alendronate (Fosamax) — Bisphosphonate** | Inhibits osteoclasts → ↓ bone resorption | Esophagitis, jaw osteonecrosis, atypical femur fx | AM, empty stomach, full glass $H_2O$, **upright × 30 min**; needs adequate Ca + Vit D |
| **Raloxifene (Evista) — SERM** | Estrogen agonist on bone | Hot flashes, **DVT/PE risk** | For postmenopausal osteoporosis; D/C before surgery/immobility |
| **Calcitonin (Miacalcin)** | ↓ Ca by inhibiting osteoclasts | Nasal irritation, flushing, N/V | Nasal spray — alternate nostrils daily |

# 8 NCLEX Test Traps ⚠

COMMON MISTAKES & WHAT STUDENTS CONFUSE

⚠ TRAP #1 — SPINACH TRAP

**Spinach is HIGH in calcium BUT contains oxalates that BLOCK absorption.** Don't pick spinach as the "best" calcium food — choose **kale, collards, or broccoli** instead.

⚠ TRAP #2 — CARBONATE VS. CITRATE

Calcium **carbonate** needs **FOOD & stomach acid**. Calcium **citrate** works **with or without food**. Pts on **PPIs/$H_2$ blockers** → use citrate (no acid available).

⚠ TRAP #3 — DRUG INTERACTIONS

Calcium **BLOCKS absorption** of: **iron, levothyroxine (Synthroid), tetracycline, fluoroquinolones, bisphosphonates**. Separate by **2+ hours**.

⚠ TRAP #4 — CKD PATIENT = CALCITRIOL ONLY

CKD patients **cannot activate** regular Vit D in the kidneys. Giving cholecalciferol ($D_3$) won't help. Must give **calcitriol (active form)**.

⚠ TRAP #5 — VITAMIN D TOXICITY IS REAL

Vit D is **fat-soluble** → stored in body → can cause **hypercalcemia** (N/V, weakness, confusion, kidney stones). More is NOT better. Keep below 4,000 IU/day unless prescribed higher.

⚠ TRAP #6 — THE "HEALTHY" FOODS THAT AREN'T

**Soda (phosphoric acid)**, **excess caffeine**, **high sodium**, and **excess protein** all **↑ urinary calcium loss**. Pt drinking 4 sodas/day with osteoporosis → priority teaching.

⚠ TRAP #7 — SUNSCREEN VS. SUN

Sunscreen SPF 8+ **blocks 95% of UV-B** → blocks Vit D synthesis. Recommend **brief unprotected exposure (15–20 min)** THEN apply sunscreen for longer outings.

⚠ TRAP #8 — ALENDRONATE (FOSAMAX) POSITION

Must take **AM, empty stomach, full glass of water, sit upright × 30 minutes**. Lying down causes **esophagitis/esophageal erosion**. Must have adequate Ca + Vit D for drug to work.

# 9 Patient & Family Education

LIFELONG BONE HEALTH STRATEGIES

## 🍽️ DIET

- 3 servings dairy or fortified alternatives daily
- Add leafy greens to meals
- Eat fatty fish 2×/week
- Read labels — choose fortified foods

## ☀️ LIFESTYLE

- 15–20 min sun (face/arms) 2–3×/week
- Weight-bearing exercise daily
- Quit smoking
- Limit alcohol & soda

## 💊 SUPPLEMENT TIPS

- Take Ca with Vit D for best absorption
- Split doses (max 500–600 mg/dose)
- Keep hydrated (prevent stones)
- Don't exceed limits

## 👶 PREGNANCY & CHILDREN

- Pregnant/lactating: 1,000 mg Ca + 600 IU Vit D
- Breastfed infants need Vit D drops (400 IU/day)
- Teens (9–18): 1,300 mg Ca for peak bone mass

## 👴 OLDER ADULTS

- 1,200 mg Ca + 800 IU Vit D daily
- DEXA scan for osteoporosis screening
- Fall-proof the home
- Annual Vit D level check

## 🔬 SPECIAL POPULATIONS

- **Lactose intolerant:** Lactaid milk, hard cheeses, yogurt, fortified plant milk
- **Vegan:** Tofu, tahini, fortified plant milks
- **Dark skin/veiled:** May need supplement

# 10 Memory Boosters & Mnemonics

STICK-IN-YOUR-BRAIN PATTERNS

### 💪 "MILK" — Top Calcium Foods

**M** ilk & dairy
**I** n leafy greens (kale, collards)
**L** ittle fish w/ bones (sardines, salmon)
**K** ernels & seeds (almonds, sesame)

### ☀️ "SUN" — Top Vitamin D Sources

**S** almon & fatty fish
**U** V sunlight (15–20 min)
**N** ourished/fortified foods (milk, OJ, cereal)

### 🦴 "CAT" — Hypocalcemia S/S

**C** onvulsions (seizures)
**A** rrhythmias
**T** etany (Trousseau's & Chvostek's)

### 🥛 "Got Milk + D"

Calcium and Vitamin D are **PARTNERS** —
You can't have one without the other.

*Vit D unlocks the door for $Ca^{2+}$ absorption.*

### 🔄 "STEROIDS Steal" — Drug-Induced Loss

### 🚫 "BAD for BONES"

**S**teroids · **A**nticonvulsants
**P**PIs · **L**oop diuretics

*All deplete calcium & Vit D*

**B**ooze (alcohol)
**O**ver-caffeine (>3 cups/day)
**N**icotine (smoking)
**E**xcess sodium & soda
**S**edentary lifestyle

## 🧠 NCJMM Clinical Judgment Framework

**STEP 1**
**RECOGNIZE CUES**
Bone pain, frequent fractures, muscle cramps, fatigue, low Ca/Vit D labs, dietary recall shows no dairy or sun exposure.

**STEP 2**
**ANALYZE CUES**
Connect findings: ↓ Ca + ↓ Vit D + risk factors (age, CKD, malabsorption, dark skin, anticonvulsants) → deficiency.

**STEP 3**
**PRIORITIZE HYPOTHESES**
#1 Safety/fall risk → #2 Cardiac/seizure (severe) → #3 Nutritional deficiency → #4 Long-term osteoporosis prevention.

**STEP 4**
**GENERATE SOLUTIONS**
Diet teaching (Ca + Vit D foods), supplement plan, sun exposure, weight-bearing exercise, fall-proofing, med review.

**STEP 5**
**TAKE ACTION**
Educate on food sources, administer supplements correctly, monitor labs, refer to dietitian, ensure safety.

**STEP 6**
**EVALUATE OUTCOMES**
Ca & 25-OH-D normalize, no fractures, improved DEXA scan, pt verbalizes 3 Ca-rich + 3 Vit D-rich foods.