HOT TOPIC ON

VITAMIN D

BENEFITS AND RISKS

Rational Prescription of Vitamin D In General Practice

Prof. Than Than Aye

Dr. Ye Myint

UNIVERSITY OF MEDICINE 2

YANGON

21.01.2018


UVEDOSE 100 000 UI
Cholécalciférol 2,5 mg (Vit D3)
Sol. Buvable (2 ml)

Available Vitamin D In Myanmar

Daily Value 400 IU

Strong bone, Teeth, Immune Health (Once a day)

Cholecalciferol - D3 1000 IU (25mcg) 250% - 100 per sf gel

Cholecalciferol - D3 2000 IU (50mcg) 500% - 42 per sf gel

Cholecalciferol - D3 5000 IU (125mcg) 1250% - 83 per sf gel

Varieties Of Vit D

Ergocalciferol(Vit D2)

Cholecalciferol (Vit D3)

Dihydrotachysterol

Alphacalcidol (1.α-hydroxy cholecalciferol)

Calcitriol (1,25 –Dihydroxycholecalciferol)

Available Vitamin D + Calcium

Calcium + D3 (D2)

Calcium 400mg + D3 200 IU 1 tablet BD to tds daily - 125

Calcium 500mg + D3 200 IU 1 tablet OD to BD daily – 50

Calcium 500mg + D3 100 IU 1 tablet OD to BD daily - 100

Calcium 600mg + D3 400 IU 1 tablet BD daily

Danger Of Vitamin D Intoxication

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Adult Hypervitaminosis D-A Case Series

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Abstract

Prolonged hypervitaminosis D can result in calcium deposition in the soft tissues (especially the kidneys and heart), changes in the central nervous system & in severe cases, death. Patients and clinicians considering supplementation above currently recommended levels should be made aware of the possible toxicities of treatment with vitamin D, and baseline calcium and parathyroid hormone and vitamin D levels should be ascertained. We report here 8 such cases, all presenting with nausea, vomiting, polyuria, polydipsia, weakness and the common history of administration of vitamin D for backache, osteoarthritis, osteoporosis, leg cramps or generalized weakness. Laboratory tests revealed hypercalcemia and hypervitaminosis D in all cases. Vitamin D intoxication from increase in vitamin D intake may have become frequent in recent years due to an understanding of the role of 25-hydroxy vitamin D in the pathogenesis of several diseases. The importance of this case series as a warning against overtreatment and unnecessary treatment with high dose vitamin D cannot be overemphasized, especially as a public health measure in a country where vitamin D deficiency in children manifesting with rickets is a risk.

Keywords: Hypervitaminosis D; Vitamin D, Cholecalciferol; Toxicity; Parathyroid; Hypercalcemia

Danger Of Vitamin D Intoxication

SPECIAL FEATURE

Clinical Review

Vitamin D Supplementation and Risk of Toxicity in Pediatrics: A Review of Current Literature

Maria G. Vogiatzi, Elka Jacobson-Dickman, Mark D. DeBoer, for the Drugs, and Therapeutics Committee of The Pediatric Endocrine Society

Weill Cornell Medical College (M.G.V.), New York, New York 10065; SUNY Downstate Medical Center (E.J.-D.), Brooklyn, New York 11203; and University of Virginia Health System (M.D.D.), Charlottesville, Virginia 22908

Context: Although vitamin D toxicity is rare in children, increased use of vitamin D formulations, re-examination of optimal vitamin D levels, and use of higher doses lend potential for an increased incidence of vitamin D toxicity.

Evidence Acquisition: A PubMed search was conducted through May 2013 for cases of vitamin D intoxication and vitamin D trials in pediatrics. Safety data were collected and reviewed.

Evidence Synthesis: A small number of pediatric studies tested vitamin D doses at or above the currently recommended upper tolerable intake. In children and adolescents, vitamin D excess was rare and usually asymptomatic. Recent cases of intoxication relate to errors in manufacturing, formulation, or prescription; involve high total intake in the range of 240 000 to 4 500 000 IU; and present with severe hypercalcemia, hypercalciuria, or nephrocalcinosis. However, mild hypercalcemia and hypervitaminosis using currently recommended doses have been reported in infants with rickets.

Conclusions: Although rare, cases of vitamin D intoxication that present with dramatic life-threatening symptoms still occur in children. Moreover, recent studies in infants raise a potential need for monitoring vitamin D levels when doses at or above the currently recommended upper range are used. Further studies are needed to clarify these findings. The Drugs and Therapeutics Committee of the Pediatric Endocrine Society suggests obtaining serum 25-hydroxyvitamin D levels in infants and children who receive long-term vitamin D supplementation at or above the upper level intake that is currently recommended. (*J Clin Endocrinol Metab* 99: 1132–1141, 2014)

Danger Of Vitamin D Intoxication

Original Article

High-dose Vitamin D Supplementation Precipitating Hypercalcemic Crisis in Granulomatous Disorders

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Departments of Endocrinology and [1]Nephrology, Vydehi Institute of Medical Sciences and Research Center, Bengaluru, Karnataka, India

Abstract

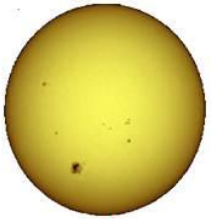
Background: Vitamin D supplementation precipitating hypercalcemic crisis is often the first manifestation in patients with granulomatous disorders. **Methods:** We report our experience on patients presenting with hypercalcemic crisis due to granulomatous disorder and the role of Vitamin D supplementation in the precipitation of hypercalcemic crisis in them. **Results:** The study included five patients with granulomatous disorders who presented with hypercalcemic crisis. All patients initially presented with nonspecific constitutional symptoms to other health-care centers to receive high-dose Vitamin D supplementation (60,000 U/week or 600,000 U intramuscular single dose). All of these patients presented with hypercalcemic crisis (serum calcium: 16.04 ± 0.3 mg/dl) to our centers after a period of 32.8 ± 9.62 days. Three patients were diagnosed to have sarcoidosis, and two were diagnosed to have tuberculosis. All five patients had parathyroid hormone-independent hypercalcemia with elevated serum 1,25-dihydroxy Vitamin D. Serum angiotensin-converting enzyme level was elevated in all the three patients with sarcoidosis. Fluorine-18-fluorodeoxyglucose positron emission tomography/computed tomography was performed in two patients with sarcoidosis which demonstrated diffusely increased tracer uptake in liver. In these two patients, liver biopsy confirmed the diagnosis. **Conclusions:** High-dose Vitamin D supplementation is most often the underlying cause of hypercalcemic crisis in patients with granulomatous disorders. Hence, high-dose Vitamin D supplementation should be used judiciously.

Keywords: Hypercalcemic crisis, sarcoidosis, Vitamin D

Evaluation, Treatment, And Prevention Of Vitamin D Deficiency: An Endocrine Society Clinical Practice Guideline

Michael F. Holick, Neil C. Binkley, Heike A. Bischoff-Ferrari, Catherine M. Gordon, David A. Hanley, Robert P. Heaney, M. Hassan Murad, and Connie M. Weaver

Vitamin D Synthesis



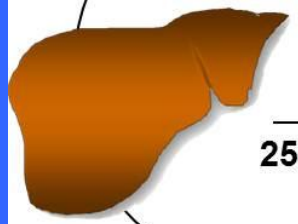
Sun

Cholecalciferol
[pre-vitamin D3]

UVB

7-dehydrocholesterol

Skin



Calcidiol

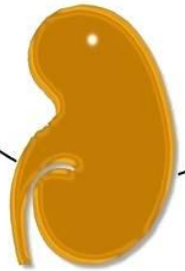
25-hydroxyvitamin D3
[25-OH-D3]

25-hydroxylase

Calcitriol

Biologically active form

1, 25-dihydroxyvitamin D3
[1,25-(OH)2-D3]



1-alpha-hydroxylase

- Small Bowel Calcium Absorption
- Renal Calcium re-absorption
- Bone Calcium release
- Affects approx. 2000 genes
- Regulation of cell proliferation
- Affects every tissue inc. Brain
- Affects Leptin signaling

Vitamin D Physiology

- 1,25(OH)2D stimulates intestinal calcium absorption.
- 1,25(OH)2D interacts with its vitamin D receptor in the osteoblast that changes to osteoclasts, and mobilize calcium and other minerals from the skeleton.
- In the kidney, 1,25(OH)2D stimulates calcium reabsorption from the glomerular filtrate.
- 1,25(OH)2D stimulates its own destruction by enhancing the expression of the 25-hydroxyvitamin into water-soluble inactive forms.

Vitamin D Biological Functions

A wide range of biological actions:

- **inhibiting cellular proliferation**
- **inducing terminal differentiation**
- **inhibiting angiogenesis**
- **stimulating insulin production**
- **inhibiting renin production**
- **stimulating macrophage cathelicidin production**
- **regulating up to 200 genes**

Prevalence Of Vitamin D Deficiency

- 25(OH)D of less than 20 ng/ml. (50 nmol/liter) = Vitamin D deficiency (IOM)

- 25(OH)D of more than 150 ng/ml (375 nmol/liter) = Vitamin D intoxication

- Vitamin D deficiency is common in Australia, the Middle East, India, Africa, and South America.

- 20–100% of U.S., Canadian, and European elderly men and women - vitamin D deficient.

Table (5) Baseline Biochemical Parameters Of Calcium And Placebo Group (Myanmar 20-73 yrs, BMI >23) ye myint et al,2016

Variables	Calcium group (n=50) Mean (SD)	Placebo group (n=50) Mean (SD)	P value
Insulin (µU /ml)	21.9(15.56)	19.9(12.86)	0.485
HOMA-IR	5.14(3.71)	4.51(2.93)	0.352
FiCa (mg/dl)	2.64(1.19)	3.01 (1.58)	0.190
PTH (pg/ml)	57.88(17.05)	61.14 (13.86)	0.297
25(OH)Vit D (ng /ml)	29.13(14.08)	27.91(18.29)	0.709

Vitamin D Deficiency

At risk populations

- Breastfed infants
- Older adults
- People with limited sun exposure
- Darker skin pigments
- Certain religious groups

Causes Of Vitamin D Deficiency

- The major source - natural sunlight.
- There is an inverse association of serum 25(OH)D and obesity.
- Fat mal absorption syndromes and bariatric patients, nephrotic syndrome.
- Anticonvulsants and AIDS/HIV drugs, enhance the catabolism.
- Lymphomas, and primary hyperparathyroidism increased metabolism

Consequences Of Vitamin D Deficiency

- **Vitamin D deficiency results in abnormalities in calcium, phosphorus, and bone metabolism.**
- **Rickets.**
- **Osteomalacia**
- **Isolated or generalized aches and pains in bones and muscles.**
- **Muscle weakness;**
  - Children - difficulty standing and walking,
  - Elderly - increasing sway and frequent falls, thereby increasing their risk of fracture.

Vitamin D intoxication

The main consequence of vitamin D toxicity

- **Hypercalcaemia**
- **poor appetite,**
- **Nausea**
- **Vomiting.**
- **Weakness**
- **Frequent urination**
- **Abdominal cramps**
- **Nervousness**
- **Itching**
- **kidney failure**

Sources Of Vitamin D

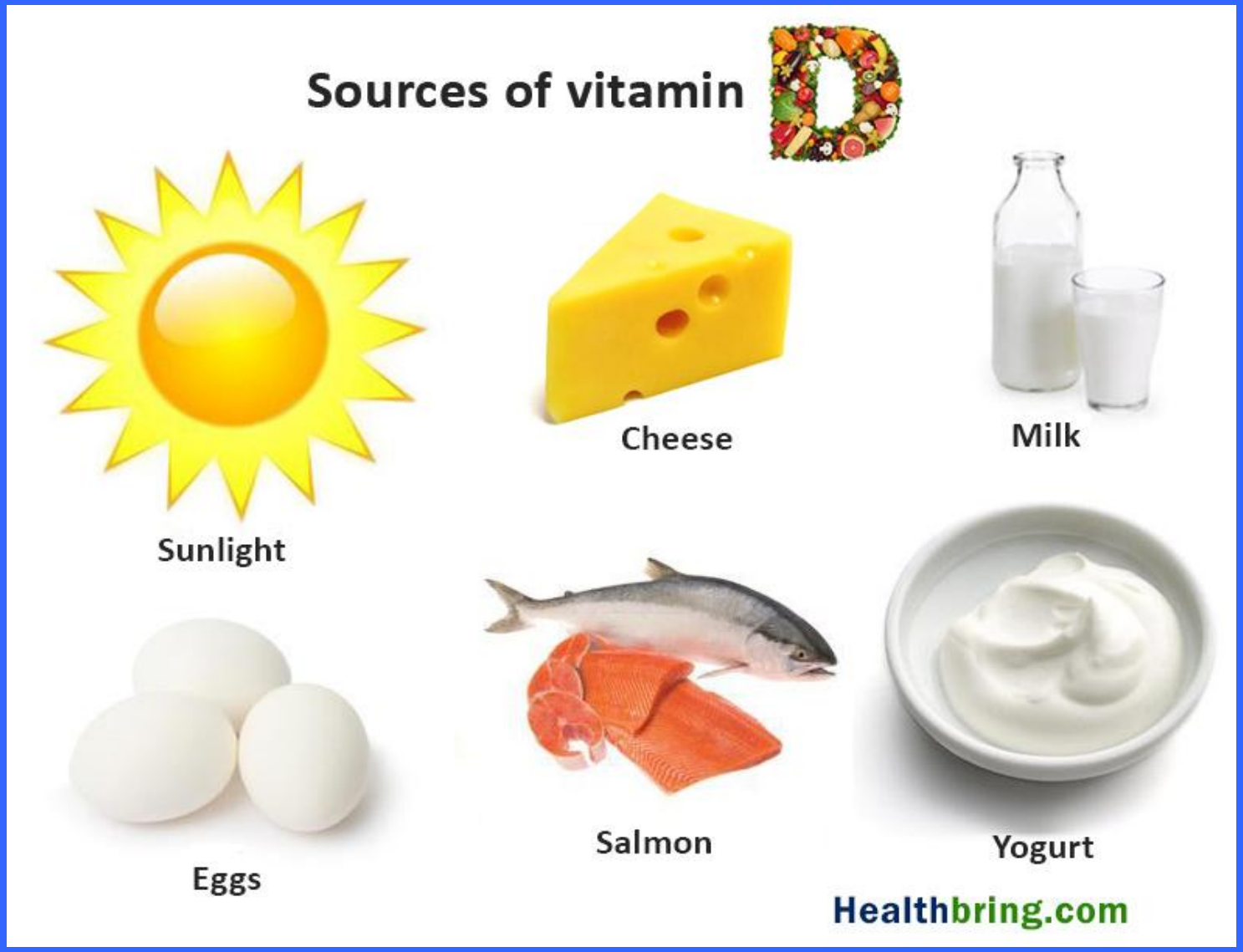
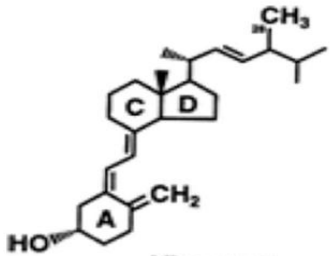
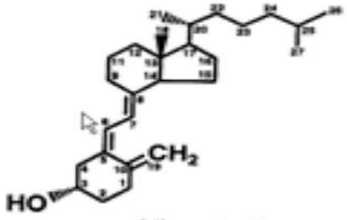


TABLE 1. Sources of vitamin D_2 and vitamin D_3

Source	Vitamin D content
Natural sources	 Vitamin D_2 (Ergocalciferol)  Vitamin D_3 (Cholecalciferol)
Cod liver oil	~400–1,000 IU/teaspoon vitamin D_3
Salmon, fresh wild caught	~600–1,000 IU/3.5 oz vitamin D_3
Salmon, fresh farmed	~100–250 IU/3.5 oz vitamin D_3, vitamin D_2
Salmon, canned	~300–600 IU/3.5 oz vitamin D_3
Sardines, canned	~300 IU/3.5 oz vitamin D_3
Mackerel, canned	~250 IU/3.5 oz vitamin D_3
Tuna, canned	236 IU/3.5 oz vitamin D_3
Shiitake mushrooms, fresh	~100 IU/3.5 oz vitamin D_2
Shiitake mushrooms, sun-dried	~1,600 IU/3.5 oz vitamin D_2
Egg yolk	~20 IU/yolk vitamin D_3 or D_2
Sunlight/UVB radiation	~20,000 IU equivalent to exposure to 1 minimal erythemal dose (MED) in a bathing suit. Thus, exposure of arms and legs to 0.5 MED is equivalent to ingesting ~3,000 IU vitamin D_3.
Fortified foods	
Fortified milk	100 IU/8 oz, usually vitamin D_3
Fortified orange juice	100 IU/8 oz vitamin D_3
Infant formulas	100 IU/8 oz vitamin D_3
Fortified yogurts	100 IU/8 oz, usually vitamin D_3
Fortified butter	56 IU/3.5 oz, usually vitamin D_3
Fortified margarine	429 IU/3.5 oz, usually vitamin D_3
Fortified cheeses	100 IU/3 oz, usually vitamin D_3
Fortified breakfast cereals	~100 IU/serving, usually vitamin D_3
Pharmaceutical sources in the United States	
Vitamin D_2 (ergocalciferol)	50,000 IU/capsule
Drisdol (vitamin D_2) liquid	8,000 IU/cc
Supplemental sources	
Multivitamin	400, 500, 1,000 IU vitamin D_3 or vitamin D_2
Vitamin D_3	400, 800, 1,000, 2,000, 5,000, 10,000, and 50,000 IU

IU = 25 ng. [Reproduced with permission from M. F. Holick: *N Engl J Med* 357:266–281, 2007 (3). © Massachusetts Medical Society.]

Food Sources Of Vitamin D

3 oz smoked salmon = 583 IU

3 oz light tuna, canned in oil = 229 IU

1 large, whole egg = 29 IU

Foods Fortified With Vitamin D

8 oz skim milk = 115 IU

8 oz orange juice = 100 IU

1 cup Cheerios = 40 IU

½ cup yogurt = 40 IU

1.0 Diagnostic Procedure

1.1 We recommend screening for vitamin D deficiency in individuals at risk for deficiency.

We do not recommend population screening for vitamin D deficiency in individuals who are not at risk (1|QQQQ).

1.0 Diagnostic Procedure

1.2 : We recommend using the serum circulating 25-hydroxyvitamin D [25(OH)D] level, measured by a reliable assay, to evaluate vitamin D status in patients who are at risk for vitamin D deficiency.

- **We recommend against using the serum 1,25-dihydroxyvitamin D [1,25(OH)2D] assay for this purpose and are in favor of using it only in monitoring certain conditions, such as acquired and inherited disorders of vitamin D and phosphate metabolism (1|QQQQ).**

TABLE 2. Indications for 25(OH)D measurement (candidates for screening)

- Rickets
- Osteomalacia
- Osteoporosis
- Chronic kidney disease
- Hepatic failure
- Malabsorption syndromes
  - Cystic fibrosis
  - Inflammatory bowel disease
  - Crohn's disease
  - Bariatric surgery
  - Radiation enteritis
- Hyperparathyroidism
- Medications
  - Antiseizure medications
  - Glucocorticoids
  - AIDS medications
  - Antifungals, *e.g.* ketoconazole
  - Cholestyramine
- African-American and Hispanic children and adults
- Pregnant and lactating women
- Older adults with history of falls
- Older adults with history of nontraumatic fractures
- Obese children and adults (BMI > 30 kg/m^2)
- Granuloma-forming disorders
  - Sarcoidosis
  - Tuberculosis
  - Histoplasmosis
  - Coccidiomycosis
  - Berylliosis
- Some lymphomas

Diagnostic point

- 25(OH)D of less than 20 ng/ml (50 nmol/l) = deficiency
- 25(OH)D of 21–29 ng/ml (52.5–72.5 nmol/l) = insufficiency
- 25(OH)D more than 150 ng/ml (375 nmol/l) = intoxication
- Up to 100 ng/ml (250 nmol/l) = safe

2.0 Recommended Dietary Intakes Of Vitamin D For Patients At Risk For Vitamin D Deficiency

2.1 : Aged 0 to 1 yr - 400 IU/d

- Aged 1 yr to 18yrs - 600 IU/d
- To raise the blood level of 25(OH)D consistently above 30 ng/ml (75 nmol/liter) may require at least 1000 IU/d of vitamin D (2|QQQQ).

2.0 Recommended Dietary Intakes Of Vitamin D For Patients At Risk For Vitamin D Deficiency

2.2 : Aged 19 to 50 yr - 600 IU/d

It is unknown whether 600 IU/d is enough to provide all the potential non skeletal health benefits associated with vitamin D. However, to raise the blood level of 25(OH)D consistently above 30 ng/ml may require at least 1500–2000 IU/d of vitamin D (2|QQQQ).

2.0 Recommended Dietary Intakes Of Vitamin D For Patients At Risk For Vitamin D Deficiency

2.3 We suggest that all adults aged 50–70 and 70 yr require at least 600 and 800 IU/d, respectively, of vitamin D.

Whether 600 and 800 IU/d of vitamin D are enough to provide all of the potential nonskeletal health benefits associated with vitamin D is not known at this time.

However, to raise the blood level of 25(OH)D above 30 ng/ml may require at least 1500–2000 IU/d of supplemental vitaminD(2|QQQQ).

2.0 Recommended Dietary Intakes Of Vitamin D For Patients At Risk For Vitamin D Deficiency

2.4 We suggest that pregnant and lactating women require at least 600 IU/d of vitamin D and recognize that at least 1500–2000 IU/d of vitamin D may be needed to maintain a blood level of 25(OH)D above 30 ng/ml (2|QQQE).

2.0 Recommended Dietary Intakes Of Vitamin D For Patients At Risk For Vitamin D Deficiency

2.5 : We suggest that obese children and adults and

children and adults on anticonvulsant medications, glucocorticoids, antifungals such as ketoconazole,

and medications for AIDS be given at least two to three times more vitamin D for their age group to satisfy their body's vitamin D requirement (2|QQQQ).

2.0 Recommended Dietary Intakes Of Vitamin D For Patients At Risk For Vitamin D Deficiency

2.6 : We suggest that the maintenance tolerable upper limits (UL) of vitamin D, which is not to be exceeded without medical supervision, should be

1000 IU/d for infants up to 6 months,

1500 IU/d for infants from 6 months to 1 yr,

2500 IU/d for children aged 1–3yr,

3000 IU/d for children aged 4–8yr, and

4000 IU/d for everyone over 8yr.

However, higher levels of 2000 IU/d for children 0–1 yr, 4000 IU/d for children 1–18yr, and 10,000 IU/d for children and adults 19yr and older may be needed to correct vitamin D deficiency (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.1 We suggest using either vitamin D2 or vitamin D3 for the treatment and prevention of vitamin D deficiency (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.2 For infants and toddlers aged 0–1 yr who are vitamin D deficient,

we suggest treatment with 2000 IU/d of vitamin D2 or vitamin D3, or

with 50,000 IU of vitamin D2 or vitamin D3 once weekly for 6 wk to achieve a blood level of 25(OH)D above 30 ng/ml,

followed by maintenance therapy of 400-1000 IU/d (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.3 For children aged 1–18 yr who are vitamin D deficient, we suggest treatment with 2000 IU/d of vitamin D2 or vitamin D3 for at least 6 wk or

with 50,000 IU of vitamin D2 once a week for at least 6 wk to achieve a blood level of 25(OH)D above 30 ng/ml,

followed by maintenance therapy of 600-1000 IU/d (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.4 : We suggest that all adults who are vitamin D deficient be treated with 50,000 IU of vitamin D2 or vitamin D3 once a week for 8 wk or

its equivalent of 6000 IU of vitamin D2 or vitamin D3 daily to achieve a blood level of 25(OH)D above 30 ng/ml,

followed by maintenance therapy of 1500–2000 IU/d (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.5 In obese patients, patients with malabsorption syndromes, and patients on medications affecting vitamin D metabolism, we suggest a higher dose (two to three times higher; at least 6000–10,000 IU/d) of vitamin D to treat vitamin D deficiency to maintain a 25(OH)D level above 30 ng/ml, followed by maintenance therapy of 3000–6000 IU/d (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.6 : In patients with extra renal production of 1,25(OH)2D, we suggest serial monitoring of 25(OH)D levels and serum calcium levels during treatment with vitamin D to prevent hypercalcemia (2|QQQQ).

3.0 Treatment And Prevention Strategies

3.7 : For patients with primary hyperparathyroidism and vitamin D deficiency, we suggest treatment with vitamin D as needed. Serum calcium levels should be monitored (2|QQQQ).

4.0 Non calcemic Benefits Of Vitamin D

4.1 : We recommend prescribing vitamin D supplementation for fall prevention. We do not recommend prescribing vitamin D supplementation beyond recommended daily needs for the purpose of preventing cardiovascular disease or death or improving quality of life (2|QQQQ).

TABLE 3. Vitamin D intakes recommended by the IOM and the Endocrine Practice Guidelines Committee

Life stage group	IOM recommendations				Committee recommendations for patients at risk for vitamin D deficiency	
	AI	EAR	RDA	UL	Daily requirement	UL
Infants						
0 to 6 months	400 IU (10 μg)			1,000 IU (25 μg)	400–1,000 IU	2,000 IU
6 to 12 months	400 IU (10 μg)			1,500 IU (38 μg)	400–1,000 IU	2,000 IU
Children						
1–3 yr		400 IU (10 μg)	600 IU (15 μg)	2,500 IU (63 μg)	600–1,000 IU	4,000 IU
4–8 yr		400 IU (10 μg)	600 IU (15 μg)	3,000 IU (75 μg)	600–1,000 IU	4,000 IU
Males						
9–13 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	600–1,000 IU	4,000 IU
14–18 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	600–1,000 IU	4,000 IU
19–30 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
31–50 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
51–70 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
>70 yr		400 IU (10 μg)	800 IU (20 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
Females						
9–13 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	600–1,000 IU	4,000 IU
14–18 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	600–1,000 IU	4,000 IU
19–30 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
31–50 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
51–70 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
>70 yr		400 IU (10 μg)	800 IU (20 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
Pregnancy						
14–18 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	600–1,000 IU	4,000 IU
19–30 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
31–50 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
Lactation[a]						
14–18 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	600–1,000 IU	4,000 IU
19–30 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU
31–50 yr		400 IU (10 μg)	600 IU (15 μg)	4,000 IU (100 μg)	1,500–2,000 IU	10,000 IU

AI, Adequate intake; EAR, estimated average requirement; UL, tolerable upper intake level.

[a] Mother's requirement, 4,000–6,000 IU/d (mother's intake for infant's requirement if infant is not receiving 400 IU/d).

Take home message

Diagnostic point

- 25(OH)D of less than 20 ng/ml (50 nmol/l) = deficiency
- 25(OH)D of 21–29 ng/ml (52.5–72.5 nmol/l) = insufficiency
- 25(OH)D more than 150 ng/ml (375 nmol/l) = intoxication
- Up to 100 ng/ml (250 nmol/l) = safe

Recommended Dose Vit D

0-1 year 400-1000 IU/d

8-older 400-4000 IU/d

infants deficient 2000 IU/d or 50,000 IU/wk for 6 wk

Adult Deficient 6000 IU/d or 50,000 IU /wk for 8 wk

Maintenance therapy 400–2000 IU/d

Contradication For Vit D

High Calcium Levels ARE a Vitamin D Contraindication

High blood calcium levels or conditions that can lead to high calcium levels such as:

- *** High Calcium Levels**
- *** Sarcoidosis**
- *** Tuberculosis**
- *** Parathyroid disease**

are 'relative' Vitamin D Contraindications.

THANK YOU


Q
Q
A
A