



Primary Care Pathway for the treatment of adult Vitamin D deficiency in patients with eGFR ≥ 30 ml/min/1.73m²

Serum 25-hydroxyvitamin D (25-OHD) concentration	Vitamin D status	Manifestation	Management
<25nmol/L	Deficient	Rickets, Osteomalacia	Treat with high dose vitamin D
25-50nmol/L	Insufficient	Associated with disease risk	Vitamin D supplementation
50-75nmol/L	Adequate	Healthy	Lifestyle advice
>75nmol/L	Optimal	Healthy	None

Does patient have symptom(s) of vitamin D deficiency?

- Gradual onset and persistent musculoskeletal pain (often in back or lower limbs)
- Proximal muscle weakness
- Waddling gait

OR

Is the patient in one of the following high risk groups?

- Osteoporosis patients who will be, or who are being, prescribed potent antiresorptive agents (e.g. zoledronic acid or denosumab)
- Osteomalacia
- On certain medication that may, for example, decrease bone mineral density, increase risk of osteomalacia, increase vitamin D metabolism, or interfere with vitamin D absorption (e.g. rifampicin, highly active antiretrovirals, antiepileptics, cholestyramine, glucocorticoids, antifungals)

No

Does patient fall into another risk category?

- Age ≥ 65 years
- Pregnant
- Breastfeeding
- Low or no exposure to the sun (e.g. those who cover their skin for cultural reasons; housebound patients; care home residents)
- Pigmented skin (e.g. people of African, African-Caribbean or South Asian origin)
- Risk of falls

No

Yes

Refer to secondary care if the patient has (this list is not exhaustive):

- Malabsorption syndromes, short bowel or cholestatic liver disease**
 - Adjusted doses may be required
- Primary Hyperparathyroidism**
 - Vitamin D replacement: Initiate in secondary care due to risk of worsening hypercalcaemia; treatment can be continued in primary care
 - Vitamin D maintenance: Use preparations that contain vitamin D only
- Chronic Kidney Disease (CKD) (eGFR <30ml/min/1.73m²)**

Do NOT check vitamin D levels; consider alternative diagnosis

Do not routinely check vitamin D levels if asymptomatic

Investigations: Serum 25-OHD; bone profile (Ca²⁺, PO₄); U&Es; LFTs

Yes

Deficiency: 25-OHD level <25nmol/L

Treat deficiency by prescribing by brand as:

- Invita D3 50,000 units oral solution (colecalciferol)**
DOSE: 50,000 units (1mL single dose oral solution) once weekly for 6 weeks
(Invita D3 is a licensed medicine in the UK. It is suitable for vegetarians) Cost: Price of 6 week course £12.50

In patients with corrected calcium levels >2.50mmol/L vitamin D replacement should only be initiated with advice from secondary care. Check Ca²⁺ after 4 weeks in these patients.

Insufficiency: 25-OHD level 25–50nmol/L

Recommend vitamin D supplements that can be purchased, as well as providing lifestyle advice
(see overleaf for additional information)

- Regular, safe, sun exposure
- Dietary sources of vitamin D
- Vitamin D supplements **1,000 – 2,000 units daily**. Select 1,000 units daily where 25-OHD level closer to 50nmol/L, and 2,000 units daily where 25-OHD level closer to 25nmol/L (**ideally recommend patient to purchase—see options overleaf**)
- Supplemental calcium is not required for most patients, but ensure adequate calcium intake for those at risk of osteoporosis (e.g. postmenopausal women, vegans, and those on bisphosphonate therapy)
- Consider retesting serum 25-OHD after a minimum of 3 months in deficient patients, insufficient patients remaining symptomatic, and patients on anti-epileptics
- Seek advice from secondary care for patients remaining deficient/insufficient who have been compliant with treatment
- Monitor bone profile, electrolytes, and 25-OHD annually and review need for continued supplementation

Adequate: 25-OHD level >50nmol/L

Provide lifestyle advice
(see overleaf for additional information)

- Regular, safe, sun exposure
- Dietary sources of vitamin D
- Consider recommending vitamin D supplements where appropriate (see below) that can be purchased (see overleaf for suitable products)
- Ensure adequate vitamin D plus calcium supplementation for those with or at risk of osteoporosis (e.g. postmenopausal women, vegans, and those on bisphosphonate therapy), where the optimal 25-OHD level is >75nmol/L

The Department of Health recommends vitamin D supplementation for the following groups:

- People aged 65 years and over** and people who are **not exposed to much sun**—take a daily supplement containing 400 units (10mcg) of vitamin D
- All pregnant and breastfeeding women**—take a daily supplement containing 400 units (10mcg) of vitamin D

The MHRA recommends that vitamin D supplementation is considered for at-risk patients who receive treatment with primidone, phenytoin, carbamazepine, phenobarbital, or sodium valproate.

Maintenance therapy following treatment

Sun Exposure

- Over 90% of the body's vitamin D is produced from the action of sunlight on the skin; sun exposure (where burning does not occur and no sun protection is used) between 10am to 3pm from April to October for 5-15mins should be sufficient to improve vitamin D status
- In a fair skinned person, 20-30 minutes of sunlight exposure to the face and forearms at midday generates about 2000 units (50mcg) of vitamin D
- Two or three sunlight exposures per week can achieve adequate vitamin D levels in the summer so long as the individuals have sufficient levels to begin with. The elderly, and those with a deficiency or pigmented skin, will need an increased exposure time or frequency to achieve an adequate level of vitamin D
- Unprotected sun exposure should be avoided in patients with xeroderma pigmentosum. The risks and benefits of sun exposure for those with a history of skin cancer or actinic keratosis will need to be carefully considered

Dietary Sources

- Excellent food sources (greater than 200 units (5mcg) per portion of vitamin D) include 2 teaspoons of cod liver oil, 70g sardines tinned in tomato sauce or oil (drained), 100g tinned salmon, pilchards or tuna, 100g cooked salmon, 110g of cooked mackerel or herring, and 130g cooked kipper. Other sources include egg yolks, mushrooms, fortified breakfast cereals, milk, and margarine.

Examples of adult vitamin D nutritional supplements available to purchase <i>Patients should be encouraged to purchase products from a reputable source</i>			
Product	Approx. price	Source	Suitability
Holland and Barrett Sunvite D3 Fast acting liquid 1000 units (25mcg)/10 drops	59mls £16.99	Available for purchase only from Holland and Barrett www.hollandandbarrett.com	<i>Suitable for vegetarians but not vegans</i>
BioLife Vitamin D3 1000 units (25mcg) tablets	90 chewable tablets £9.95	Available for purchase only from Lifestyle Natural Health www.lifestylenaturalhealth.co.uk	<i>Suitable for vegetarians but not vegans</i>
Boots Pharmaceuticals Vitamin D3 1000 units (25mcg) tablets	90 tablets £5.10	Available for purchase only from Boots	<i>Suitable for vegetarians but not vegans</i>
Nature's Remedy Vitamin D3 1000 units (25mcg) tablets/capsules	250 tablets/capsules £14.99	Available for purchase only from Natures Remedy www.naturesremedy.co.uk	<i>Suitable for vegetarians but not vegans</i>
Deva Vegan Vitamin D Vitamin D2 800 units (20mcg) tablets	90 tablets £5.99	Available for purchase online	<i>Suitable for vegetarians and vegans</i>
Valupak Vitamin D3 1000units (25mcg) tablets	60 tablets £0.99	Available from various supermarkets, chemists and online	<i>Suitable for vegetarians but not vegans</i>
Calceos Vitamin D3 400 units (10mcg) and calcium carbonate 1.25g tablets <i>Other combined calcium and vitamin D preparations are listed in the current BNF</i>	60 chewable tablets £3.58	Available over the counter from pharmacies or on prescription	<i>Not suitable for vegetarians, vegans, or people with peanut/soya allergy</i>

Examples of adult vitamin D UK licensed products available on prescription			
Fultium D3 Vitamin D3 800 units (20mcg) capsules	30 capsules £3.60	Prescription Only Medicine	<i>Contains arachis (peanut) oil; not suitable for vegetarians or vegans</i>
Desunin Vitamin D3 800 units (20mcg) tablets	30 tablets £3.60	Prescription Only Medicine	<i>Suitable for vegetarians, but not vegans</i>
Aviticol D3 800units (20mcg) capsules	30 capsules £3.60	Prescription Only Medicine	<i>Not suitable for vegetarians or vegans</i>

Examples of adult vitamin D nutritional supplements suitable for pregnant women			
Healthy Start Vitamins for Pregnant women Vitamin D3 400 units (10mcg) (Also contains vitamin C and folic acid)	56 tablets free of charge where eligible; £0.91 for purchase	Available from midwives, health visitors and childrens centres and also some pharmacies. For more info visit www.healthystart.nhs.uk	<i>Suitable for vegetarians but not vegans</i>
Pregncare multivitamins and minerals Vitamin D3 400 units (10mcg) (Also contains multiple other constituents)	30 tablets Prices vary from £4-£6	Various supermarkets, chemists and online	<i>Suitable for vegetarians but not vegans</i>
Sanatogen Mum to Be Multivitamins and minerals Vitamin D3 400 units (10mcg) (Also contains multiple other constituents)	60 tablets Prices vary from £5 to £13	Various supermarkets, chemists and online	<i>Suitable for vegetarians but not vegans</i>

References

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- Product Choices for Vitamin D Supplementation for People At-risk of Vitamin D Deficiency. PrescQIPP Bulletin 19 (June 2012)
- Vitamin D and Bone Health: A Practical Clinical Guideline for Patient Management. National Osteoporosis Society (April 2013)
- Vitamin D – advice on supplementation for at risk groups. Department of Health (2nd February 2012)
- Vitamin D: Deficiency and Insufficiency – practical information for GPs. PrescQIPP Bulletin 20 (July 2012)
- Vitamin D deficiency & insufficiency: using appropriate available products. East & South East England Specialist Pharmacy Services (June 2011)
- What dose of vitamin D should be prescribed for the treatment of vitamin D deficiency? UKMi Q&A 82.1 (29th October 2010)