

Vitamin D Management in Children

Vitamin D deficiency is common, but its management can be an area of confusion owing to lack of high quality evidence in children. The National Osteoporosis Society published a [practical clinical guideline](#) in December 2018 regarding suggested definition, prevention, investigation and management of Vitamin D deficiency. This guideline is based on their recommendations, alongside NICE CKS "[Vitamin D deficiency in children](#)", and local recommendations regarding specific management options following collaboration with acute trusts.

Note this guideline does not include vitamin D management in certain specialist groups, e.g. cystic fibrosis and chronic renal disease. Please consult the relevant specialist departments for these patients.

Children with chronic illness including renal / liver disease and malabsorption will require monitoring of vitamin D levels as per their own specialist care recommendations.

ROUTINE TESTING is generally NOT recommended unless one of the following applies:

- Symptoms and signs of rickets e.g. progressive bowing of legs, progressive knock knees, wrist swelling, swelling of the costochondral joints, craniotabes, delayed tooth eruption and enamel hypoplasia
- Patients with **PERSISTENT SYMPTOMS** that could be attributed to vitamin D deficiency e.g. long standing (> 3 months) bone pain, muscular weakness (such as difficulty climbing stairs, waddling gait, difficulty rising from a chair or delayed walking), tetany due to low plasma calcium, seizures due to low plasma calcium, infantile cardiomyopathy
- Treatment with bone-targeted drugs that require vitamin D sufficiency such as bisphosphonates
- Abnormal investigations: low plasma calcium or phosphate, high alkaline phosphatase (greater than the local age appropriate reference range), radiographs – showing osteopenia, rickets or pathological fractures

NO

No prescribed treatment required
Reinforce safe sun and dietary advice. More info in [appendix 3](#).

YES

Test 25-hydroxyvitamin D (25[OH]D) (Also measure: U+Es, LFTs, and bone profile)

PTH should be checked if calcium < 2.15 mmol / L or > 2.6mmol / L. X-ray wrist / knee if there are concerns of rickets (see [appendix 1](#)). Vitamin D will naturally be lower October-March due to seasonal variation

< 25 nmol / L

Treatment

Referral criteria

Prescribe **TREATMENT DOSE – Colecalciferol oral solution (Thorens preferred brand)** – [appendix 4](#)
Recheck vitamin D and bone profile to ensure normal at end of treatment course

If not normal: check compliance and consider malabsorption or genetic rickets – discuss with local paediatric endocrinology team

25 – 50 nmol / L

Is the patient symptomatic?
See [appendix 1](#)

NO

YES

Refer to secondary care if the patient has any of the following:

- Symptomatic vitamin D deficiency i.e. clinical evidence of rickets
- Symptomatic of hypocalcaemia or bone disease

If normal: reinforce safe sun and dietary advice. Prescribe only in exceptional cases if self-care not appropriate – see [appendix 3](#). Screen +/- treat other family members

> 50 nmol / L

Reinforce safe sun and dietary advice

Prevention / maintenance dose supplements (**purchased OTC**) advised for the following groups of patients:

- Breastfed babies from birth to 1 year
 - Formula-fed babies having less than 500ml of infant formula a day
 - Children aged 1 – 4 years old should be given a daily supplement
 - Children who have had treatment for vitamin D deficiency and symptoms – these children need long-term prevention supplements
 - Children in at risk group – see [appendix 1](#).
- See [appendix 3](#) for doses.

Supplements to be purchased OTC. Prescribe only in exceptional cases if self-care not appropriate – see [appendix 3](#)

Appendix 1: Risk factors and symptoms / signs of deficiency

Routine vitamin D level testing of asymptomatic patients is not recommended, but address lifestyle factors and assess the need for prevention dose supplements. **Investigate if symptomatic** as per flowchart on page 1.

Children with chronic illness including renal / liver disease and malabsorption will require monitoring of vitamin D levels as per their own specialist guidance.

Table 1: Risk factors for vitamin D deficiency

Inadequate UVB light exposure	Inadequate dietary intake or absorption	Metabolic factors
<ul style="list-style-type: none"> • Pigmented skin (non-white ethnicity) • Lack of sunlight exposure or atmospheric pollution • Skin concealing garments or routine use of sun protection factor 15 or above • Housebound or indoor living (e.g. care homes) • Seasonal 	<ul style="list-style-type: none"> • Vegetarian (or other fish-free diet) • Breastfeeding considered as prolonged, even if mother has sufficient vitamin D • Exclusion diets e.g. milk allergy • Malabsorption (e.g. coeliac disease, Crohn's disease, pancreatic enzyme insufficiency etc.) • Short bowel • Cholestatic liver disease, jaundice • Children and young people with family members with proven vitamin D deficiency 	<ul style="list-style-type: none"> • Drug interactions e.g. rifampicin, anticonvulsants (carbamazepine, oxcarbazepine, phenobarbital, phenytoin, primidone and valproate), isoniazid, cholestyramine, sucralfate, glucocorticoids, highly active antiretroviral treatment (HAART) • Chronic liver disease • Chronic renal disease • Are obese (body mass index above the 98th centile for age and sex) – vitamin D may be sequestered into adipose tissue reducing bioavailability

Symptoms / signs that could be attributed to vitamin D deficiency

- Hypocalcaemic seizures (usually in infancy)
- Tetany due to low serum calcium
- Cardiomyopathy
- Aches and pains e.g. long-standing (>3 months), unexplained bone pain
- Muscular weakness (e.g. difficulty climbing stairs, waddling gait, difficulty rising from a chair or delayed walking)
- Rickets: swollen ankles / wrists, rachitic rosary (swelling of the costochondral junctions), progressive bowing of legs, progressive knock knees, craniotabes (skull softening with frontal bossing and delayed fontanelle closure), delayed tooth eruption and enamel hypoplasia
- Incidental investigation finding (low serum calcium or phosphate, high alkaline phosphatase)
- Treatment with bone-targeted drugs that require vitamin D sufficiency such as bisphosphonates
- Abnormal radiographs – showing osteopenia, rickets or pathological fractures

Appendix 2: Patient information about vitamin D and lifestyle advice

For lifestyle advice see the patient information leaflet at the end of this guidance.

More information for patients is available on the following websites:

- [NHS Website – Vitamin D](#)
- [Osteoporosis Society: Nutrition for bones](#)
- [Royal National Orthopaedic Hospital: FAQs about Vitamin D in childhood](#)
- [Royal College Obstetrics and Gynaecologists: Healthy eating and vitamin supplements in pregnancy](#)
- [BDA Vitamin D: Food Fact Sheet](#)

Appendix 3: Prevention / maintenance supplements in children

National guidance recommends prevention / maintenance doses between 300 – 600 units daily (7.5 – 15 micrograms). As a general recommendation, and for ease of dosing / product choice, 400 units per day should be considered.

- *Formula-fed babies should not be given a vitamin D supplement until they are having less than 500ml (about a pint) of infant formula a day, as infant formula is fortified with vitamin D*
- *300 units (7.5micrograms) daily is considered sufficient if using Healthy Start Vitamin Drops for prevention therapy*
- *For children 5 years and over: Public Health England suggest that children should consider taking a daily supplement containing 400 units (equivalent to 10 micrograms) of vitamin D during autumn and winter when there is limited sun exposure. All year round supplements should be considered for people who have very little or no sunshine exposure e.g. housebound, in a residential home, usually wear clothes that cover up most of the skin*

Patients should buy vitamin D supplements unless they meet one of the specific vitamin D exception criteria in the NHS England guideline: [Conditions for which over the counter items should not routinely be prescribed in primary care](#) (on pg. 17).

Note that maintenance or preventative treatment is not an exception for vitamin D prescribing. Exceptions to self-care are also listed in the [BMA Over-the-counter medicines guidance](#).

Prescriptions for vitamin D should be reserved for the treatment of patients with symptoms of deficiency or confirmed deficient vitamin D levels that require treatment with loading doses. Subsequent maintenance doses should then be purchased over the counter.

Vitamin D supplements and multivitamin preparations (tablets, capsules, and liquids) containing 400 units (10 micrograms) of vitamin D can be purchased from pharmacies. Advise families to check vitamin D strength as this may be relatively low in multivitamin or combined preparations.

Healthy Start vitamins

Healthy Start vitamins (www.healthystart.nhs.uk) for women and children are free of charge for low income families and are available from Sure Start centres and [some other health centres](#). You can also ask your midwife or health visitor for where they are available locally.

For those people who are not eligible for Healthy Start vitamins, a range of vitamin D3 supplements are available for purchase over the counter. **Patients should be advised to speak to their pharmacist if they are unsure which product to buy.**

If preventative / maintenance vitamin D is prescribed (as per NHSE / BMA exception criteria):

Age	Recommended product Thorens (colecalfiferol) 10,000 units / ml 1 drop (0.02 ml) contains 200 units
0 years – 12 years	400 units (2 drops) once daily
12 years – 18 years	600 – 800 units (3 – 4 drops) once daily

There is currently no licensed oral vitamin D3 preparation available that would be suitable for a vegan diet. There are unlicensed products available that may be suitable, please see the Specialist Pharmacist Service document "[Which vitamin D preparations are suitable for a vegetarian or vegan diet?](#)" for more information.

Appendix 4: Treatment doses

Treatment Options

Oral is the preferred route of treatment. See chart below for prevention and treatment doses. Liquid concentrations have been selected based on Neonatal & Paediatric Pharmacists Group / Royal College of Paediatrics and Child Health guidance.

A dose of 10 micrograms of Vitamin D = 400 units.

Remember: treatment doses should be followed by a maintenance prevention daily dose of vitamin D long-term (certainly until growth completed) – see [appendix 3](#).

Treatment doses

Daily dosing

Thorens (colecalfiferol) 10,000 units / ml (1 drop (0.02 ml) contains 200 units)		
Age	Dose	Course length
Below 6 months	3,000 units daily (15 drops / 0.3 ml)	8 – 12 weeks
6 months – 12 years	6,000 units daily (30 drops / 0.6 ml)	8 – 12 weeks
12 years – 18 years	10,000 units daily (50 drops / 1 ml)	8 – 12 weeks

Weekly dosing

Thorens (colecalfiferol) 10,000 units / ml (1 drop (0.02 ml) contains 200 units)		
Age	Dose	Course length
Below 6 months	20,000 units once a week (100 drops / 2 ml)	8 – 12 weeks
6 months – 12 years	40,000 units once a week (200 drops / 4 ml)	8 – 12 weeks
12 years – 18 years	70,000 units once a week (350 drops / 7 ml)	8 – 12 weeks

Stexerol-D3 (colecalfiferol) 25,000 unit tablets		
12 years – 18 years	75,000 units once a week (3 tablets)	8 – 10 weeks

Whilst the doses above may differ from those stated within the respective SPC, they are in line with national guidance published by [NICE](#) and [ROS](#). The Thorens SPC states “national posology recommendations in prevention and treatment of vitamin D deficiency can be followed”

Thorens drops contain olive oil. Stexerol-D3 is gelatin free and suitable for vegetarians. There is currently no licensed oral vitamin D3 preparation available that would be suitable for a vegan diet. There are unlicensed products available that may be suitable, please see the Specialist Pharmacist Service document “[Which vitamin D preparations are suitable for a vegetarian or vegan diet?](#)” for more information.

Note:

- Activated preparations of vitamin D such as alfacalcidol or calcitriol are NOT indicated for the treatment of simple vitamin D deficiency
- Combination preparations of vitamin D / calcium are not required to treat vitamin D deficiency – however, it is important to assess that dietary intake of calcium is sufficient and to supplement where insufficient or where there is documented hypocalcaemia.

Secondary Care Only Alternative Options

High Dose Intramuscular Treatment (secondary care only)

A high dose vitamin D therapy given intramuscularly in a single dose

Advantages:

- Compliance is not an issue
- Faster improvement in biochemical marker (4 – 7 days), compared with daily dose (2 – 3 weeks)
- Overcome malabsorption problems

Disadvantages:

- IM injection (needle phobia issues), which cannot be given with a plastic syringe
- Variability in absorption characteristics

Doses for over 2 years (for patients under 2 years old discuss with the relevant specialist paediatric team):

Age	Colecalciferol Dose	Course length
Over 2 years	300,000 units colecalciferol given as an intramuscular injection (unlicensed product) *	A single injection

*IM injections of colecalciferol are not approved for use in community settings, suitable patients should be referred to secondary care

Monitoring of response

If hypocalcaemia at presentation, seek specialist advice. If calcium is normal at presentation, no need to recheck during vitamin D treatment. Blood test should be repeated at the end of treatment to ensure normalisation of vitamin D level and other biochemical abnormalities (PTH is a good marker for normal calcium homeostasis).

If definite rickets changes on initial X-ray, consider a repeat X-ray to document improvement in radiological features after few months (the skeletal deformities may take years to normalise).

If Vitamin D deficiency or rickets do not resolve at end of treatment:

- Check compliance
- Investigate for malabsorption disorder (e.g. Coeliac disease)
- Consider genetic rickets (X-linked Hypophosphataemic rickets)

Secondary care treatment options must be discussed with the local paediatric team and are outside the scope of primary care services.

[ROS guidance](#) states that re-testing of vitamin D status is not normally required if the individual is asymptomatic and compliant with multivitamin supplements (however, [NICE](#) recommend retesting vitamin D status following a treatment course where the initial result was < 25 nmol / L). If this is not the case and maintenance treatment is clinically appropriate carry out twice a year blood screen in early autumn (Sept / October) and early spring (March / April).

For further advice on the specialist management of vitamin D deficiency cases please discuss with the local paediatric team.

Further resources:

Information on available vitamin D preparations:

- BNF for Children available at <https://bnfc.nice.org.uk/>
- Drug Tariff available at <https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff>
- Summaries of Product Characteristics available at www.medicines.org.uk/emc

National Guidance:

- Guide for Vitamin D in Childhood, Royal College of Paediatrics and Child Health, October 2013 available [here](#)
- Vitamin D and Bone Health: A practical clinical guideline for management in children and young people, National Osteoporosis Society, June 2015, updated in November 2018. Full guidance available [here](#)
- NICE Clinical Knowledge Summary (CKS) Vitamin D deficiency in children, last revised in April 2021. <https://cks.nice.org.uk/vitamin-d-deficiency-in-children>
- NICE PH56: Vitamin D: supplement use in specific population groups, November 2014, updated in August 2017) <https://www.nice.org.uk/guidance/ph56>
- NICE NG34: Sunlight exposure: risks and benefits, February 2016 <https://www.nice.org.uk/guidance/ng34>
- NHS England: Conditions for which over the counter items should not routinely be prescribed in primary care: Guidance for CCGs, March 2018 <https://www.england.nhs.uk/wp-content/uploads/2018/03/otc-guidance-for-ccgs.pdf>

Research Papers:

- McNally J.D. *et al.* Rapid Normalization of Vitamin D Levels: A Meta-Analysis. *Pediatrics* 2015; 135 (1): e152, available.
- Elder C., Bishop N. Rickets. *Lancet* 2014; 383; 9929; p1665-1676.
- Misra *et al.* Vitamin D insufficiency and deficiency in children and adolescents. Up to Date, accessed January 2015.
- Shah B.R., Finberg L. Single-day therapy for nutritional vitamin D-deficiency rickets: a preferred method. *J Pediatr.* 1994.
- Duhamel J.F., Zeghoud F., *et al.* Prevention of vitamin D deficiency in adolescents and pre-adolescents. An interventional multicenter study on the biological effect of repeated doses of 100,000 IU of vitamin D3. *Arch Pediatr.* 2000 Feb;7(2):148-53.

SPS Medicines Q&As:

- What dose of vitamin D should be prescribed for the treatment of vitamin D deficiency? April 2020 <https://www.sps.nhs.uk/articles/what-dose-of-vitamin-d-should-be-prescribed-for-the-treatment-of-vitamin-d-deficiency-2/>
- Is there a suitable vitamin D product for a patient with a peanut or soya allergy? September 2020 <https://www.sps.nhs.uk/articles/is-there-a-suitable-vitamin-d-product-for-a-patient-with-a-peanut-or-soya-allergy/>
- Which vitamin D preparations are suitable for a vegetarian or vegan diet? December 2019 <https://www.sps.nhs.uk/articles/which-vitamin-d-preparations-are-suitable-for-a-vegetarian-or-vegan-diet/>
- Dosing and monitoring for treatment of Vitamin D deficiency in pregnancy, March 2021 <https://www.sps.nhs.uk/articles/dosing-and-monitoring-for-treatment-of-vitamin-d-deficiency-in-pregnancy/#:~:text=For%20oral%20treatment%20of%20vitamin,used%20for%204%2D6%20weeks>

Nottinghamshire APC guidance:

- [Vitamin D in Adults](#)
- [Vitamin D in Children](#)
- [Patient information leaflet](#)

Vitamin D patient information

Why do we need vitamin D?

Vitamin D is needed to keep bones, teeth and muscles healthy. If you have low levels of vitamin D you may feel tired or have aches and pains, but some people don't have any symptoms at all. If vitamin D levels fall very low (known as vitamin D deficiency) bones can become soft and weak, which can lead to deformities, especially in children and young people.



How can I increase my vitamin D levels?

Our main source of vitamin D is the action of sunlight on our skin. Small amounts of sunlight, as you might get through daily activities (e.g. 15 minutes between 11am and 3pm from April to September three times a week), may help to boost your vitamin D levels. Just exposing your face and forearms to the sun should be enough. People with dark skin, e.g. of African, African-Caribbean or south Asian origin, will need to spend longer in the sun to produce the same amount of vitamin D as someone with lighter skin.

Be careful not to burn in the sun, so take care to cover up, or protect your skin with sunscreen before your skin starts to turn red or burn.

Although sunlight is the main source of vitamin D, eating vitamin D rich food is also beneficial as part of a healthy balanced diet. Food sources which are rich in vitamin D include:

- Egg yolks
- Liver
- Red meat
- Oily fish – such as salmon, sardines, herring and mackerel
- Foods fortified with vitamins – such as margarine, some breakfast cereals and vegetarian friendly foods such as soy yogurt



Who should take a vitamin D supplement?

Public Health England recommends that **everyone** should take a daily supplement of vitamin D during the *autumn and winter months*. **Most people get enough vitamin D from sunlight and food in spring and summer so don't need a supplement during these months.**

Some people can't get enough vitamin D from sunlight. You should take a daily supplement **all year-round** if:

- you are not often outdoors, for example if you are frail or housebound
- you live in a residential or care home*
- you usually wear clothes that cover up most of your skin when outdoors
- you have dark skin, such as those of African, African-Caribbean or South Asian origin
- you are pregnant or breastfeeding

Continued overleaf...

What dose of vitamin D should I take?

Adults and children over 5 years old:

Adults and children over 5 need 400 units (10 micrograms) a day. This includes pregnant and breastfeeding women.

If you have been identified by your healthcare professional as having a vitamin D deficiency, you may be advised to take a higher dose of vitamin D.

Babies and children up to 5 years old:

The Department of Health recommends that:

- breastfed babies from birth to 1 year should be given a daily supplement containing 340 units (8.5 micrograms) to 400 units (10 micrograms) of vitamin D
- formula-fed babies having less than 500ml (about a pint) of infant formula a day should be given a vitamin D supplement
- children aged 1 to 4 years old should be given a daily supplement containing 400 units (10 micrograms) of vitamin D

Where can I get vitamin D supplements?

Low cost vitamin D supplements can be purchased from pharmacies, most supermarkets and health food shops. Vitamin D is also known as colecalciferol. When you are choosing an over the counter vitamin D supplement look for vitamin D3 (colecalciferol) as this form of Vitamin D is best absorbed by your body.



GP practices in Sussex no longer routinely prescribe vitamin D supplements on the NHS. Patients currently receiving vitamin D on a repeat prescription **for routine replacement** will be reviewed and most prescriptions stopped. Patients taking calcium and vitamin D for a medical condition, such as osteoporosis, will continue to get prescriptions on the NHS.

If your vitamin D levels are very low, you may be prescribed a treatment course of vitamin D. Once the treatment course is completed, you will be advised to buy vitamin D supplements and take them long-term to prevent your vitamin D levels from falling again.

Daily supplements are available in a variety of strengths and products (these strengths may be shown as micrograms or units on the label), ask your community pharmacist for advice if you are unsure which vitamin D product would be best for you.



Women and children

Women and children may qualify for the Healthy Start scheme and can get free supplements containing the recommended amounts of vitamin D. More information can be obtained from <https://www.healthystart.nhs.uk/> or by asking your midwife / health visitor.

Further information

Further information on vitamin D from the NHS is available on the NHS website using the following links:

<https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-d/>

*[https://www.gov.uk/government/publications/vitamin-d-for-vulnerable-groups/vitamin-d-and-care-homes-guidance \(winter 2021\)](https://www.gov.uk/government/publications/vitamin-d-for-vulnerable-groups/vitamin-d-and-care-homes-guidance-winter-2021)

If you would like this information in an alternative format, please contact the NHS Sussex Public Involvement team. Phone: 01903 708411