



Diagnosis and Management of Vitamin D Deficiency in Children

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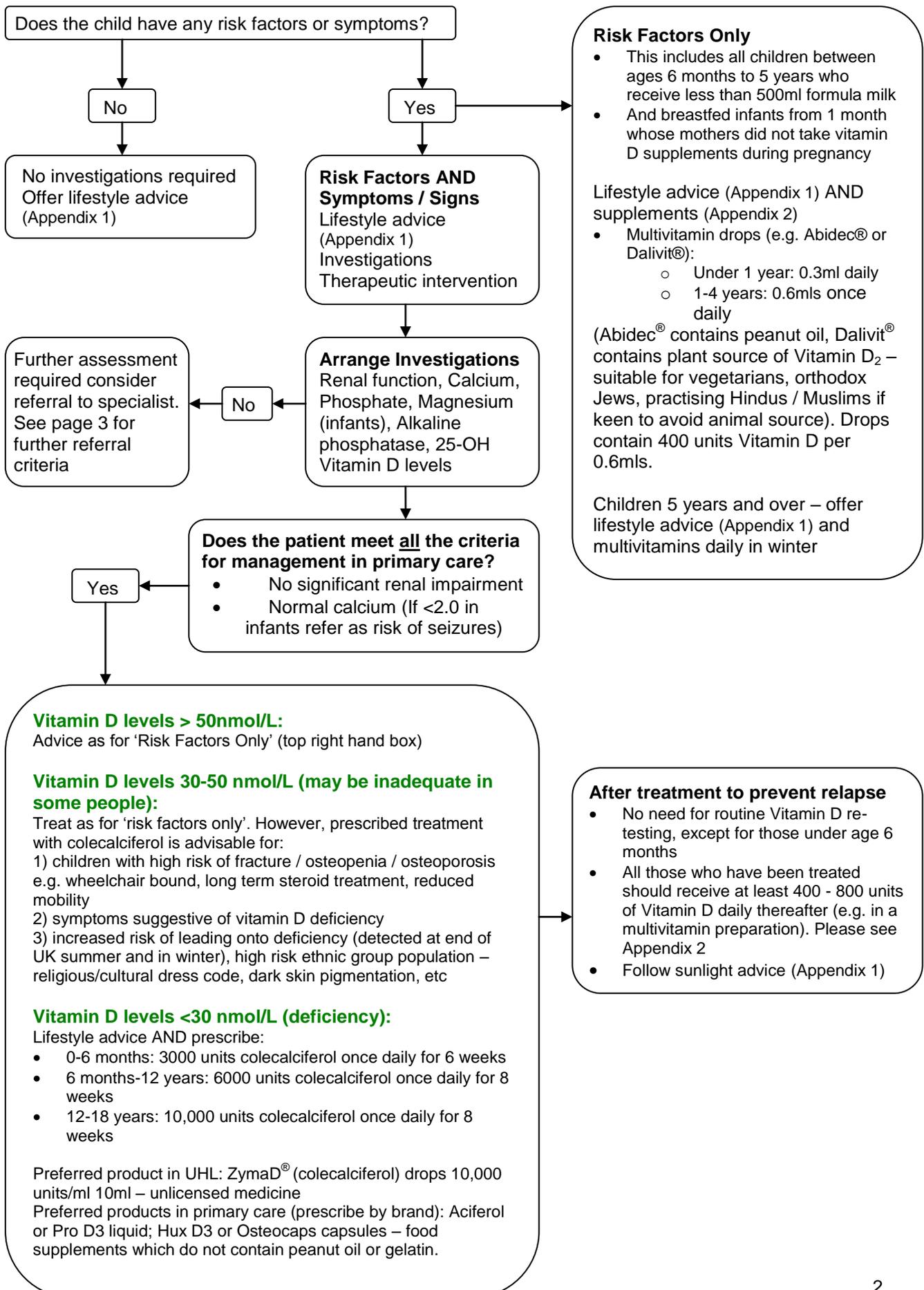
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Patient information links:

[Public Health England leaflet \(general information on prevention of deficiency\)](#)
[LMSG leaflet \(information on treatment of deficiency\)](#)

Flowchart for Children with suspected Vitamin D Deficiency

Patient's family is likely to have similar risk of Vitamin D deficiency – consider investigation and treatment



Background information

Vitamin D physiology

Vitamin D₃ (colecalciferol) is normally synthesised in the skin through the action of ultraviolet light (UVB) on cholesterol. In the UK, this can only occur from April to September between the hours 11am-3pm. In order to exert its effects on bone metabolism and calcium absorption Vitamin D is converted in the liver to 25-OH vitamin D which is the major storage form and what is measured in the laboratory. Further hydroxylation occurs in the kidney to form 1, 25-OH Vitamin D. Colecalciferol is also available in the diet, and largely obtained from seafood and its derivatives.

It is unusual to get more than 10% of total requirement from a normal diet. Colecalciferol is the preparation of choice as it is the natural vitamin in humans. However dietary supplements of a plant derived sterol (Vitamin D₂ or ergocalciferol) are also available. Vitamin D₂ has equal potency but a shorter half life.

Currently >70-80% of patients screened in UHL endocrinology clinics (and >90% of Indo-Asian origin patients) have Vitamin D deficiency or insufficiency.

Risk factors for Vitamin D deficiency

Inadequate UV light exposure	Poor oral intake	Metabolic risk
<ul style="list-style-type: none"> Northern latitude Air pollution Occlusive garments Pigmented skin Habitual sunscreen use Institutionalised / housebound and people with poor mobility i.e. wheelchair bound 	<ul style="list-style-type: none"> Vegetarian (or fish-free diet) Malabsorption, including short bowel and cholestatic jaundice Cholestyramine use All infants and young children aged 6 months to 5 years, if receiving less than 500 ml infant formula per day All breastfed infants from 1 month onwards whose mothers did not take Vitamin D supplements during pregnancy 	<ul style="list-style-type: none"> Reduced synthesis: Elderly (over 65 years) Increased breakdown e.g. Drugs (rifampicin, anticonvulsants, HAART therapy, glucocorticoids) Pregnant or breastfeeding women Reduced stores: Liver disease Multiple short interval pregnancies Reduced hydroxylation: Liver and/or kidney disease

Clinical features of Vitamin D deficiency

Symptom, Sign, Biochemistry	Children	Adult
Seizures	√	√
Tetany	√	√
Hypocalcaemia	√	√
Irritability	√	
Leg bowing	√	
Knock knees	√	
Impaired linear growth	√	
Delayed walking	√	
Limb girdle pain	√	√
Muscle pain	√	√
Proximal myopathy	√	√
Impaired innate antimycobacterial immunity	√	√

For children refer to specialist if:

- Criteria for management in primary care not met
- Deficiency established with absence of known risk factors
- Atypical biochemistry (persistent hypophosphataemia despite correction of Vitamin D levels, elevated creatinine)
- Failure to reduce alkaline phosphatase levels within 3 months of starting treatment
- Family history (parent, siblings) with severe rickets
- Infants under one month with calcium < 2.0 mmol/l at diagnosis as risk of seizure. Check vitamin D level of mothers in this group immediately and treat, particularly if breast feeding.

Appendix 1

Lifestyle Advice

Sunlight

It is impractical to offer a one-size-fits-all recommendation for the amount of sun exposure that people need to make sufficient vitamin D, because this varies according to a number of environmental, physical and personal factors.

The time required to make sufficient vitamin D is typically short and less than the amount of time needed for skin to redden and burn. Regularly going outside for a matter of minutes around the middle of the day without sunscreen should be enough. When it comes to sun exposure, little and often is best, and the more skin that is exposed, the greater the chance of making sufficient vitamin D before burning. However, people should get to know their own skin to understand how long they can spend outside before risking sunburn under different conditions. Persons wearing enveloping garments can be advised to have sunlight exposure of face, arms and legs in the privacy of their garden.

Sun exposure is the main source of vitamin D, but excessive sun exposure is the main cause of skin cancer, including melanoma, the fastest rising type of cancer in the UK. Enjoying the sun safely, while taking care not to burn, can help to provide the benefits of vitamin D without unduly raising the risk of skin cancer.

Diet

Diet is a poor source of Vitamin D compared to sunlight. Vitamin D can be obtained from dietary sources (e.g. salmon, mackerel, tuna, egg yolk), fortified foods (e.g. cow, soya, oat or rice milk), and supplements. There are no plant sources that provide a significant amount of vitamin D naturally. Consider dietary supplementation especially during the winter months.

Available Products & Supplements

- Licensed medicines should be prescribed where available; unlicensed medicines (limited guarantee of quality) or food supplements (no guarantee of quality) may be suitable following a proper consideration of potentially increased risks associated with such products as well as what may be substantial costs.
- Multivitamin supplements that include vitamin D can be bought from pharmacies, health food shops and on the internet by (see Appendix 2).
- Some patients may wish to avoid gelatine and / or peanut oil which are used in some available preparations.
- Colecalciferol (Vitamin D₃) is the preparation of choice as it is the natural vitamin in humans.

Appendix 2

Multivitamin Drops for Children available over-the-counter

There are a number of brands available, these are an example of some of them:

Healthy Start vitamin drops containing 300 IU colecalciferol per 5 drops are available from Sure Start centres. They are free to low income families, some Sure Start centres will sell them to other customers, but not all have the facility to take money.

Abidec[®]: contains arachis oil; avoid in those with peanut allergy. Cost £2.91 per 25ml

Dalivit[®]: contains plant source of Vitamin D₂; suitable for vegetarians, orthodox Jews, practising Hindus / Muslims if keen to avoid animal source) Cost £3.28 for 25ml

Abidec and Dalavit drops contain 400 units Vitamin D per 0.6mls, however other brands may vary in strength.

References

1. Vitamin D Deficiency and insufficiency, using appropriate available products, October 2012, East and South East England Specialist Pharmacy Services
2. Holick MF, Binkley NC, Bischoff-Ferrari HA. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. [J Clin Endocrinol Metab](#). 2011 Jul;96(7):1911-30
3. Pearce S, Cheetham T. Diagnosis and management of vitamin D deficiency. *BMJ* 2010; 340:b5664
4. Munns et al. Prevention and treatment of infant and childhood vitamin D deficiency in Australia and New Zealand; a consensus statement
5. Prices as at April 2014 in MIMS
6. Consensus statement, December 2010. British Association of Dermatologists, Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society. <http://www.bad.org.uk/for-the-public/skin-cancer/vitamin-d/vitamin-d-consensus-2010>
7. Holick MF. High prevalence of vitamin D inadequacy and implications for health. *Mayo Clin Proc* 2006;81:353-73.

Version control log

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8.1		Updated with New LMSG Logo and Version control Table	01/06/2015	D Stevens