ELHT Guideline for Vitamin D in Children

This guideline is based on Guideline issued by Royal College of Paediatrics & Child Health UK in October 2013. The aim of this guideline is to give advice on how to assess children with Vitamin D deficiency, how to interpret Vitamin D levels and treatment options. This guideline can be used both in primary and secondary care in East Lancashire.

What is Vitamin D ?

Vitamin D is an essential nutrient needed for healthy bones, and to control the amount of Calcium in our blood. There is recent evidence that it may prevent many other diseases.

What is the natural source of Vitamin D ?

Most people get little Vitamin D in their diet. Only a few natural foods such as oily fish and eggs (20 – 40 units per egg) contain significant amounts of Vitamin D.

A few foods are fortified with small amounts of Vitamin D (e.g. margarine and some breakfast cereals). All formula milks are fortified, but plain cow's milk is not fortified in the UK. Breast milk generally contains little Vitamin D. Sunshine is the main source of Vitamin D. However, Vitamin D can only be made in our skin by exposure to sunlight when the sun is high in the sky. Therefore, in most of the UK from November to February, and in Scotland from October to March, Vitamin D cannot be made from sunshine.

Whether ingested orally or made in the skin under the action of Ultraviolet light, Vitamin D is converted to 25hydroxyVitaminD in the liver and then on to 1,25-dihydroxyVitaminD in the kidney. It is this which has potent metabolic effects.

There are two types of Vitamin D: Ergocalciferol (Vitamin D2) a plant product and Colecalciferol (Vitamin D3) which is a fish or mammal product. The BNF and many other authorities regard them as interchangeable. *However, 'Activated Vitamin D' preparations such as Calcitriol or Alfacalcidol should NOT be used for the treatment of simple Vitamin D deficiency. They should only be used for the*

treatment of complex cases by specialists. They are ineffective in treating simple Vitamin D deficiency and can cause severe adverse effects, particularly hypercalcaemia. Simple Vitamin D is safe and is the treatment for vitamin D deficiency.

What is Vitamin Deficiency ?

Vitamin D deficiency historically has been defined as a blood level of 25hydroxyVitaminD below 30nmol/L. There is scientific debate about the optimal Vitamin D blood level. Current practice in the UK, as recommended by the British Paediatric and Adolescent Bone Group, is to continue to use that as the defined level of deficiency, and to define 'insufficiency' as between 30 and 50 nmol/L. Current practice is based on robust evidence of benefits to bone health when levels are more than 50nmol/L. Vitamin D deficiency can cause seizures and cardiomyopathy in infants, rickets and poor growth in children and muscle weakness at any age.

Interpretation of Vitamin D levels

25 HydroxyVitamin D	< 30 nmol/L	Deficiency	Need Treatment- see below
25 HydroxyVitamin D	30-50 nmol/L	Insufficient	Need Prophylaxis in prevention doses- see below
25 HydroxyVitamin D	>50 nmol/L	adequate	Lifestyle advice

Who is likely to get Vitamin D deficiency?

People particularly at risk are those with:

1. Increased need:

- Pregnant and breastfeeding women
- Infants
- Twin and multiple pregnancies
- Adolescents
- Obesity

2. Reduced sun exposure:

- Northern latitude, especially above 50 degrees latitude (e.g. UK)
- Season – in winter and spring
- Asian and African people – dark skin needs more sunshine to make Vitamin D
- wearing concealing clothing
- Immobility, e.g. inpatients or those with conditions like cerebral palsy
- Excessive use of sun block – most block UVB more than UVA

3. Limited diet (but remember sunshine is most important source of Vitamin D):

- Vegetarians and vegans
- prolonged breastfeeding – even if mother has sufficient Vitamin D
- Exclusion diets – e.g. milk allergy
- Malabsorption
- Liver disease
- Renal disease
- Some drugs – e.g. Anticonvulsants, Anti-TB drugs

Although sunshine is the usual source of Vitamin D, diet is of course the source of Calcium. It is particularly important to prevent Vitamin D deficiency in children with limited Calcium intake.

Prevention:

The Department of Health and the Chief Medical Officers recommend a dose of 7-8.5 micrograms (approx. 300 units) for ALL children from six months to five years of age. This is the dose that the NHS 'Healthy Start' vitamin drops provide. The 'Healthy Start' programme aims to provide vitamins free to people on income support. The British Paediatric and Adolescent Bone Group's recommendation is that exclusively breastfed infants receive Vitamin D supplements from soon after birth.

Adverse effects of Vitamin D overdose are rare but emerging evidence links potential adverse effects to high concentration of Vitamin D above 150nmol/L. Care should be taken with multivitamin preparations as Vitamin A toxicity is a concern. Multivitamin preparations often contain a surprisingly low dose of Vitamin D.

Standard Prevention Doses

Category	**Dose and Frequency**	**Examples of Preparations**
Up to 1 month	300-400 units daily	Abidec, Dalivit, Healthy start Vitamins
1 month – 18 years	400-1000 units daily	Over the counter preparations e.g. Abidec, Dalivit, Boots high strength Vitamin D drops

Treatment of Vitamin D Deficiency (levels < 30nmol/L)

We recommend using **Colecalciferol** for treatment. After treatment course is finished, all children should be started on oral Vitamin D supplements in prevention doses as mentioned above. The product of choice for treatment of Vitamin D deficiency is PRO D3 liquid, Sun Vit D3 capsules, Osteocaps and HUX D3 capsules. PRO D3 liquid, Sun Vit D3 capsules, Osteocaps and HUX D3 capsules are:

- Suitable for Vegetarians
- Suitable for Muslim consumption (Halal and Gelatine free)
- Suitable for a Kosher diet
- Contain no gluten, lactose or yeast
- Free from peanut oil and soya

Prescribing responsibility for Children less than 1 year old is RED traffic (Specialist ONLY). Children under 1 year will be prescribed with 7 weeks of colecalciferol solution by the paediatrician.

ONCE DAILY DOSE (TREATMENT DOSE)

Category	Oral Dose and Frequency	Duration	Prescribing Information
Up to 6 months	3,000 units daily	7 weeks	Prescribe 1 x 50mL of PRO D3 Forte 3000units/mL liquid.
6 month – 12 Year	6,000 units daily	7 weeks	Prescribe 2 x 50mL of PRO D3 Forte 3000units/mL liquid.
12-18 Years	See once a week table below for dosing regimen for 12-18 years.		

The same effect may be achieved by multiplying the dose by seven and giving it weekly if compliance is a concern.

ONCE WEEKLY DOSE (TREATMENT DOSE)

Category	Oral Dose and Frequency	Duration	Prescribing Information
Up to 6 months	20,000 units once weekly	7 weeks	Prescribe 70mL of 2000units/mL PRO D3 liquid – 10mL weekly
6 month – 12 Year	42,000 units once weekly	7 weeks	Prescribe 2 x 50mL of 3000units/mL PRO D3 Forte liquid – 14mL weekly.
	40,000 units once weekly **if using capsules**	7 weeks	Prescribe 14 x 20,000units HUX D3, Osteocaps or Sun Vit D3 capsules
12-18 Years	80,000 units once weekly	7 weeks	28 x 20,000units HUX D3, Osteocaps or Sun Vit D3 capsules.

If compliance is an issue and the patient refuses to comply with daily or weekly regiments then the dose can be given as a single once only dose orally as below.

Category	Oral Dose	Duration and frequency	Prescribing Information
Up to 6 months	90,000 units	Single dose	Prescribe 30mL of PRO D3 forte 3000units/mL liquid.
6 month – 12 Year	150,000 units	Single dose	Prescribe 50mL of PRO D3 forte 3000units/mL liquid.
	160,000 units **if using capsules**	Single dose	Prescribe 8 x 20,000 units HUX D3, Osteocaps or Sun Vit D3 capsules.
12-18 Years	300,000 units	Single dose	15 x 20,000units HUX D3, Osteocaps or Sun Vit D3 capsules.

INJECTION DOSES (TREATMENT DOSE)

Intramuscular vitamin D is no longer recommended and should only be on **specialist advice** where compliance is a serious issue or where other medical circumstances or conditions make it the first choice. Ergocalciferol is available as an injection 300,000 units/mL, please check with pharmacy for further information about availability.

Category	Dose and Frequency
Up to 12 months	150,000 units (0.5mL) as a single dose followed by oral supplementation in prophylactic doses as mentioned above.
1 year – 12 Year	300,000 units (1 mL) as a single dose followed by oral supplementation in prophylactic doses as mentioned above.
12-18 Years	300,000 units (or 600,000 units) as a single dose followed by oral supplementation in prophylactic doses as mentioned above.

Calcium supplementation is not routinely recommended and advice on increasing dietary calcium intake should be given in all children. *It is essential to check the child has a sufficient dietary Calcium intake, and that a maintenance Vitamin D dose follows immediately after the treatment dose and is continued long term (see standard prevention doses above).*

Follow-up:

Some recommend a clinical review a month after treatment starts, asking to see all vitamin and drug bottles. Routine monitoring of Vitamin D levels is generally unnecessary, but maybe appropriate in patients with symptomatic vitamin D deficiency or malabsorption and where poor compliance with medication is suspected. Current advice for children who have had symptomatic Vitamin D deficiency is that they continue a maintenance prevention dose at least until

they stop growing. Dosing regimens vary and clinical evidence is weak in this area. The RCPCH has called for research to be conducted.

Assessing the Patient

Characteristics	**Management**
No Risk Factors (see above)	No investigations, lifestyle advice and consider prevention
Risk Factors, no symptoms	Lifestyle advice and prevention
Risk Factors and symptoms or signs	Blood Test and / or X Ray. Treatment and long term prevention

The consensus statement represents the unified views of the 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:

> *'Vitamin D is essential for good bone health and for most people sunlight is the most important source of Vitamin D. The time required to make sufficient Vitamin D varies according to a number of environmental, physical and personal factors, but is typically short and less than the amount of time needed for skin to redden and burn. 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. Vitamin D supplements and specific foods can help to maintain sufficient levels of Vitamin D, particularly in people at risk of deficiency.'*

Symptoms and Signs in Children

Infants	Seizures, tetany and cardiomyopathy
Children	Aches and pains; myopathy causing delayed walking; rickets with bowed legs, knock knees, poor growth and muscle weakness
Adolescents	Aches and pains, muscle weakness, bone changes of rickets or osteomalacia

Blood Tests :

Perform following blood tests in those with signs and symptoms or significant risk factors

- 25 hydroxyvitamin D
- Calcium, Phosphate , Alkaline Phosphatase
- PTH
- X-Ray if clinically indicated.

25 hydroxyvitamin D is the standard Test and is an excellent marker of body stores. People with risk factors and symptoms of hypocalcaemia or vitamin D deficiency should have their blood level checked. The blood test requires about 2ml of serum.

Raised Alkaline phosphatase, hypocalcaemia and a high level of PTH maybe indicators of Vitamin D deficiency but basic bone biochemistry (Calcium, Phosphate and Alkaline phosphatase) can often be normal despite significant Vitamin D deficiency.

High Alkaline phosphatase is associated with rickets. PTH is produced in the neck glands when the parathyroid Calcium-sensing receptors detect a low level of blood Calcium. PTH levels are a helpful measure of Calcium and Vitamin D status. In children a high level of PTH is usually due to Vitamin D deficiency or a lack of Calcium in the diet. Other causes (e.g. parathyroid tumours or renal failure) are rare.

Treatment of Relatives:

If a patient is diagnosed with Vitamin D deficiency the family should be screened or treated. At least screening by history taking should take place, and prevention advice given. Investigation of other family members by blood testing may be indicated (refer to adult guidelines for adults). Alternatively, advise a Vitamin D supplement to those sharing the same sun exposure and diet.

After treatment, children who were deficient or insufficient should continue long-term low-dose supplements until completion of growth, unless lifestyle changes (diet/sun exposure) are assured.

Useful links

www.gov.uk/government/publications/vitamin-d-advice-on-supplements-for-at-risk-groups

www.healthystart.nhs.uk

http://bpabg.co.uk/position-statements/vitamin-d-and-fractures

www.rcpch.ac.uk/positionstatements

http://www.elmmb.nhs.uk/guidelines/disease-specific-guidelines/?assetdetesctl516557=39977&p=2

Reference

1. A Guide for Vitamin D in Childhood, Royal College of Paediatrics and Child Health, Oct 2013
2. Diagnosis and Management of Vitamin D Deficiency for Non-Specialists, ELHT guideline May 2010

Document adapted, compiled and checked by: Dr C Gardner (Consultant paediatrician, East Lancashire Hospital Trust), Dr Y Masood (Paediatric specialist Registrar. East Lancashire Hospital Trust), Akil Ahmed (Paediatric Pharmacist, East Lancashire Hospital Trust), June 2014. Review June 2016.