

South Australian Paediatric Clinical Guidelines

Vitamin D Deficiency

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Introduction

- >Vitamin D plays an essential role in calcium metabolism, bone growth and mineralisation
- >Around 90 % of our vitamin D requirement comes from exposure of the skin to sunlight. The average diet contains only about 10 % of our requirements – insufficient to prevent vitamin D deficiency (Nozza and Rodda 2001)
- >The highest rates of vitamin D deficiency occur in dark-skinned, veiled, pregnant women (80 %), with similarly high rates found in mothers of infants treated for rickets (Nowson and Margerison 2002; Diamond et al. 2005)
- >Women with darker skin produce less vitamin D for a given sunlight exposure (Grover and Morley 2001; McCullough 2007)
- >Vitamin D deficiency in mothers is the most important causative factor for vitamin D deficiency in infants (Munns et al. 2006)

Food sources of Vitamin D

- >Few foods contain significant amounts of vitamin D (e.g. fish with a high fat content such as salmon, tuna, herring, mackerel and sardines). Other sources include meat, milk and eggs
- >In Australia, some margarine, milk and milk products are fortified with vitamin D (Nowson and Margerison 2002)
- >Breast milk is an inadequate source of vitamin D (0.15 micrograms / 100 mL) in the absence of exposure of the baby to sunlight. Infant formulas are supplemented with vitamin D and will provide an adequate dietary intake of vitamin D where daily intake is at least 500 mL

Other sources of Vitamin D

- >The optimum route of vitamin D intake is via skin exposure
- >However, deliberate sun exposure between 10.00 a.m. and 2.00 p.m. in summer (11.00 a.m. and 3:00 p.m. daylight saving time) is not advised. (Diamond et al. 2005)
- >It has been shown that whole body exposure to 10-15 minutes of midday sun in summer (about 1 minimal erythral dose [MED] or the amount of sun exposure that just produces a faint redness of skin) is comparable to taking 15,000 IU (375 micrograms) of vitamin D (cholecalciferol) orally (Diamond et al. 2005)
- >On this basis, exposure of hands, face and arms (around 15 % of body surface) to around 1/3 MED should produce around 1000 IU of vitamin D (cholecalciferol) for people with moderately fair skin (Diamond et al. 2005)
- >Exposure times for people with highly pigmented skin would be 3-4 times greater (Diamond et al. 2005)

Vitamin D deficiency in pregnancy

Vitamin D status is measured as the serum level of 25-hydroxy vitamin D. Other indicators of vitamin D deficiency are rises in serum parathyroid hormone (PTH) and bone turnover

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markers. These changes begin to appear at serum 25OHD values below 61 nmol/L (Jesudason et al. 2002). Starting from that value, the following classification has proved useful to Adelaide specialists:

- >Mild vitamin D deficiency
 - > Serum 25OHD levels of 41 to 60 nmol/L
- >Moderate vitamin D deficiency
 - > Serum 25OHD levels of 26 to 40 nmol/L
- >Severe vitamin D deficiency
 - > Serum 25OHD levels below 26 nmol/L

Women with vitamin D deficiency are at risk of:

- >Osteomalacia
- >Accelerated osteoporosis due to secondary hyperparathyroidism
- >Muscle weakness

Babies of women with vitamin D deficiency during pregnancy are at risk of

- >Hypocalcaemia
- >Rickets
- >Myopathy
- >Reduced intrauterine long bone growth (Morley et al. 2006)

There is increasing evidence that vitamin D regulates many other biological processes (Gillie 2004) so vitamin D deficiency may have other consequences as yet undefined

Antenatal screening and treatment

- >Pregnant women at risk of vitamin D insufficiency (see below) are to be offered vitamin D screening at booking. They include:
 - > All veiled women e.g. Muslim, including those wearing headscarves
 - > Darker skinned women e.g. Aboriginal, North African, Indian and Sri Lankan
 - > Newly arrived refugees
 - > Anyone housebound for any reason

First appointment (booking) screening of at risk women

- >Request blood 25-hydroxy vitamin D level
- >Commence one tablet of 25 mcg Ostelin® daily or OsteVit-D containing vitamin D3 (cholecalciferol) 1000 units (which may be obtained without prescription at most pharmacies)

First follow-up of at risk women

- >Check the report of the original 25OHD assay at the next appointment

< 26 nmol/L

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- > Repeat 25OHD level to see if it has normalised.
- > Continue vitamin D 1,000 units daily

26 nmol/L – 60 nmol/L

- > Repeat 25OHD level to see if it has normalised
- > Continue vitamin D 1000 units daily

> 60 nmol/L

- > Discontinue vitamin D

Subsequent follow-up of at risk women

Depending on the second 25OHD assay:

If 25OHD > 60 nmol/L

- > Continue vitamin D 1,000 units daily

If 25OHD < 60 nmol/L

- > Increase dose to vitamin D 2,000 units daily

Discharge

- > All at risk women require a follow-up letter to their General Practitioner with a recommendation for a repeat 25OHD assay at 6 months and vitamin D should be resumed if indicated

Neonatal management

- > Breast milk fed infants of veiled or dark skinned mothers, mothers who are housebound or who are recently arrived refugees should be routinely supplemented with a daily dose of 400 IU of vitamin D (0.45 mL of Pentavite) until at least 12 months of age (Munns et al. 2006)

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