South Australian Perinatal Practice Guideline

Vitamin D Status in Pregnancy

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Note:

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

Explanation of the aboriginal artwork:
The aboriginal artwork used symbolises the connection to country and the circle shape shows the strong relationships amongst families and the aboriginal culture. The horse shoe shape design shown in front of the generic statement symbolises a woman and those enclosing a smaller horse shoe shape depicts a pregnant women. The smaller horse shoe shape in this instance represents the unborn child. The artwork shown before the specific statements within the document symbolises a footprint and demonstrates the need to move forward together in unison.

Australian Aboriginal Culture is the oldest living culture in the world yet Aboriginal people continue to experience the poorest health outcomes when compared to non-Aboriginal Australians. In South Australia, Aboriginal women are 2-5 times more likely to die in childbirth and their babies are 2-3 times more likely to be of low birth weight. The accumulative effects of stress, low socio economic status, exposure to violence, historical trauma, culturally unsafe and discriminatory health services and health systems are all major contributors to the disparities in Aboriginal maternal and birthing outcomes. Despite these unacceptable statistics the birth of an Aboriginal baby is a celebration of life and an important cultural event bringing family together in celebration, obligation and responsibility. The diversity between Aboriginal cultures, language and practices differ greatly and so it is imperative that perinatal services prepare to respectively manage Aboriginal protocol and provide a culturally positive health care experience for Aboriginal people to ensure the best maternal, neonatal and child health outcomes.

Purpose and Scope of Perinatal Practice Guideline (PPG)

To guide clinicians with the management of women and their newborns who are at risk of, or are found to have, vitamin D insufficiency/deficiency in pregnancy.

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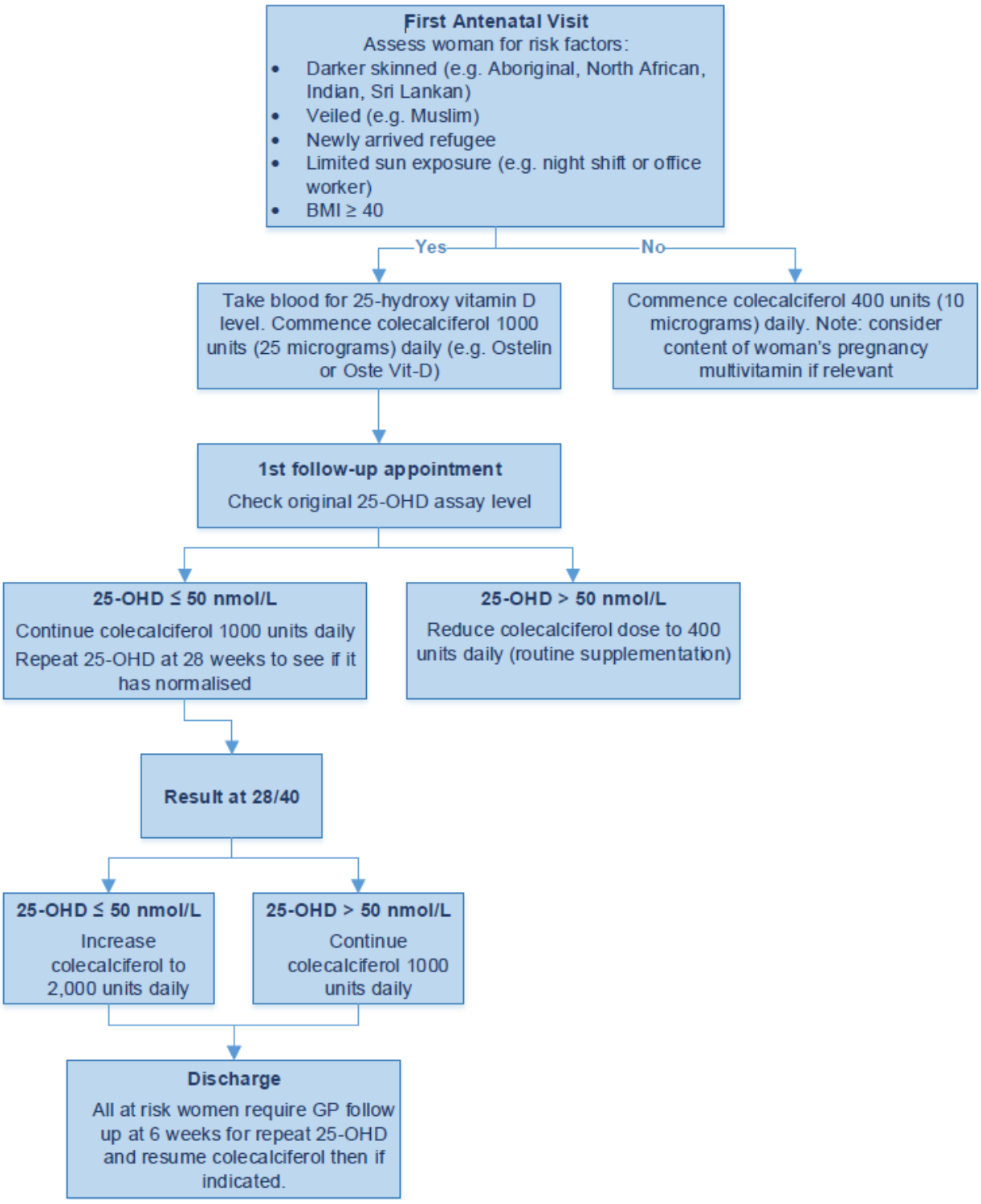
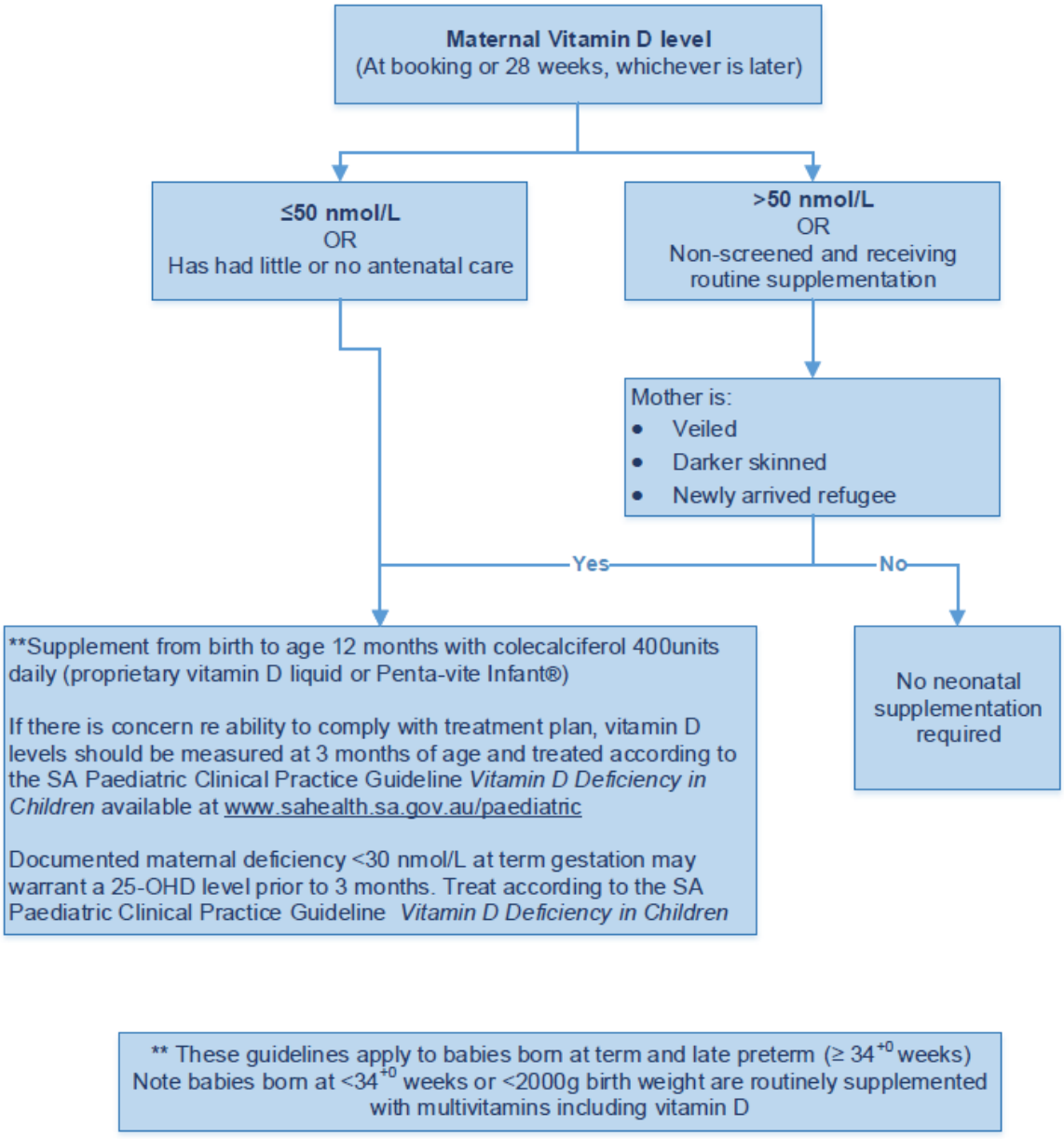
Flowchart 1: Management of Vitamin D Status in Pregnancy



Flowchart 2: Newborn Management



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Summary of Practice Recommendations

All women should be screened for risk factors at their first antenatal visit.

All women not at risk of vitamin D deficiency should commence colecalciferol 400 units daily as part of routine supplementation.

Women at risk of vitamin D deficiency should have blood taken for 25-hydroxy vitamin D level

Women at risk of vitamin D deficiency should commence 1,000 units (25 micrograms) of colecalciferol per day.

Subsequent management of women and their babies is dependent on 25-OHD levels at 28 weeks gestation.

Abbreviations

AI	Adequate intake
a.m.	Ante meridiem (before noon)
BMI	Body mass index (kg/m^2)
e.g.	For example
et al.	And others
MED	Minimal erythemal dose
mL	Millilitre(s)
nmol/L	Nanomoles per litre
25-OHD	25-hydroxy-vitamin D
PTH	Parathyroid hormone
p.m.	Post meridiem (after noon)
Vit	Vitamin

Definitions

Vitamin D *sufficiency*	Serum 25-OHD levels >50 nmol/L
Vitamin D *insufficiency*	Serum 25-OHD levels of 30 to 50 nmol/L
Vitamin D *deficiency*	Serum 25-OHD levels <30 nmol/L

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[1].

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[2,3].

High rates of vitamin D deficiency have been found in low risk South Australian antenatal populations, with risk-based screening failing to detect over half of deficient women[4].

BMI is inversely proportional to serum vitamin D levels, with one study showing a BMI ≥40 was associated with a 24% lower serum 25-OHD (25-hydroxy-vitamin D) level compared to those with BMI <25[5].

Women with darker skin produce less vitamin D for a given sunlight exposure[6,7].

Neonatal vitamin D deficiency is always caused by maternal deficiency[8].

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 and milk and milk products are fortified with vitamin D[2].

Breast milk is an inadequate source of vitamin D and exclusive breastfeeding is a risk factor for neonatal rickets[8].

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[3].

It has been shown that whole body exposure to 10-15 minutes of midday sun in summer (about 1 minimal erythemal dose [MED] or the amount of sun exposure that just produces a faint redness of skin) is comparable to taking 15,000units (375 micrograms) of vitamin D (colecalciferol) orally[3].

On this basis, exposure of hands, face and arms (around 15 % of body surface) to around 1/3 MED should produce around 1,000units of vitamin D (colecalciferol) for people with moderately fair skin[3].

Exposure times for people with highly pigmented skin would be 3-4 times greater[3].

Vitamin D content of multivitamins

A large proportion of women take multivitamins in pregnancy[9].

The vitamin D content of commonly used pregnancy multivitamins are as follows:

- Blackmores Pregnancy & Breastfeeding Gold
  - 500units per capsule = 1000units/day (i.e. 2 tablets)
- Elevit Pregnancy Multivitamin
  - 200 units per tablet = 200units/day
- Swisse Pregnancy + Ultivite
  - 600units per capsule = 600units/day

Vitamin D status in pregnancy

Recent consensus guidelines recommend the following classification of vitamin D status[8]. These are in line with those already in use by The Royal Australian and New Zealand College of Obstetricians and Gynaecologists[10].

- Vitamin D *sufficiency*
  - Serum 25-OHD levels >50 nmol/L
- Vitamin D *insufficiency*
  - Serum 25-OHD levels of 30 to 50 nmol/L
- Vitamin D *deficiency*
  - Serum 25-OHD levels <30 nmol/L

Women with vitamin D insufficiency/deficiency are at risk of:

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

Vitamin D insufficiency/deficiency in pregnancy may be associated with:

- Hypertension
- Pre-eclampsia
- Increased primary Caesarean section rates[11]

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

- Hypocalcaemia and seizures
- Rickets
- Myopathy
- Reduced intrauterine long bone growth[12]

Although there is some evidence for risk reduction with vitamin D supplementation, further randomised controlled trials are required to confirm the benefits[13]. Despite this, a strategy for supplementation and treatment of maternal vitamin D deficiency is recommended[10,11].

Antenatal screening and treatment

First appointment (booking) screening of at risk women

Pregnant women at risk of vitamin D insufficiency/deficiency (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
> Women with limited sun exposure for any reason e.g. night shift or office workers

Vitamin D supplementation for ALL pregnant women

Pregnant women without known risk factors

Commence colecalciferol 400 units daily as part of routine supplementation e.g. 0.2ml Ostelin Vitamin D Liquid® (1,000 units/0.5ml) or half tablet of OsteVit-D® (equivalent to 500 units) (which may be purchased from a community pharmacy without a prescription). See appendix 1 for information for women.

Note: Also consider the vitamin D content of the woman's pregnancy multivitamin, then supplement if required.

Pregnant women with known risk factors

Request blood 25-hydroxy vitamin D (25-OHD) level

Commence 1,000 units (25 micrograms) of colecalciferol daily (e.g. one capsule of Ostelin®, one tablet of OsteVit-D® or 0.5mL Ostelin Vitamin D Liquid® (1,000 units/0.5ml) (which may be purchased from a community pharmacy without a prescription). See appendix 2 for information for women.

Note: Also consider the vitamin D content of the woman's pregnancy multivitamin and then adjust the supplement if required.

First follow-up of at risk women

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

Vitamin D ≤50 nmol/L

> Continue vitamin D 1,000 units daily
> Repeat 25-OHD level at 28/40 to see if it has normalised

Vitamin D > 50 nmol/L

> Decrease vitamin D to 400 units daily

Subsequent follow-up of at risk women

Depending on the second 25-OHD assay:

If 25OHD > 50 nmol/L

> Continue vitamin D 1,000 units daily

If 25OHD ≤ 50 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 25-OHD assay at 6 weeks and vitamin D should be resumed then if indicated.

Neonatal management

Universal supplementation of infants with vitamin D is recommended in global consensus guidelines[8]. However, Australian and New Zealand guidelines recommend targeted supplementation of infants with the following risk factors: maternal vitamin D deficiency, exclusive breast feeding, and dark skin and/or social or cultural factors that could lead to lack of exposure to sunlight[14].

The following considerations are the basis for recommendations for neonatal supplementation, taking into account published recommendations and an approach to protocol implementation that optimises adherence and minimises harm. See appendix 3 for information for parents.

- In the absence of maternal risk factors (women not normally screened and are receiving 400units of colecalciferol), babies do not need routine vitamin D supplementation.
- Vitamin D supplementation at 400units daily is safe in babies. There is a wide therapeutic safety window for 25-OHD in neonates, with toxicity unlikely below levels of 250nmol/L[14].
- Breast milk vitamin D content approximates 4units per 100mL[15], and term infant formula (fortified with vitamin D) approximates 40units per 100mL (typical range 30-48units referenced from manufacturer labelling). Daily intake from formula is unlikely to meet the recommended adequate intake (AI is 400units assuming minimal sun exposure), whereas the addition of 400units daily supplement is unlikely to cause toxicity.
- Supplementation of both breast milk and formula fed babies with risk factors increases the simplicity of the protocol, and may reduce a maternal perception that breast milk is inadequate.
- Even if maternal vitamin D sufficiency is assumed at full term on the basis of supplementation and normal maternal 25-0HD levels, the lifestyle, social and cultural factors that affected the mother may persist after the baby's birth and impact the baby. Supplementation based on risk factors even if maternal supplementation has normalised maternal levels is reasonable.
- Serum 25-OHD levels are not generally measured in babies <3 months of age. However where a clinician has measured 25-OHD levels, definitions of deficiency and treatment follow the **SA Paediatric Clinical Practice Guideline:** *Vitamin D Deficiency in Children* (available at www.sahealth.sa.gov.au/paediatric) and the **SA Neonatal Medication Guidelines:** *Colecalciferol* and *Multivitamins* (available at www.sahealth.sa.gov.au/neonatal).
- Sunlight exposure in babies needs to balance risks of skin damage with the benefit of vitamin D synthesis and no firm recommendations can be made. The following suggested advice to parents is modified from the ANZ position statement[14].

	Light to olive skin	Brown, dark brown and black skin
UV index ≥3	Full protection advised – sunscreen, hat, clothing, shade	Hat, clothing, shade, intermittent sun exposure of arms and legs without sunscreen for approximately 10-15 minutes per day encouraged
UV index <3	Sunscreen not required. Intermittent sun exposure of arms and legs for 10-15 minutes encouraged.	Encourage sun exposure of arms and legs during outdoor activity

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Fact Sheet

Routine Vitamin D Supplementation in Pregnancy

About Vitamin D

Vitamin D is needed to keep bones healthy and strong.

- Most (90%) vitamin D comes from exposing your skin to the sun. A balance of sun exposure and sun protection is needed to make enough Vitamin D.
- Some (10%) vitamin D comes from food such as oily fish, meat, milk and eggs.

What happens if you do not have enough vitamin D?

Many people with low vitamin D do not have symptoms.

Vitamin D deficiency can cause:

- Rickets (soft bones) in children
- Muscle cramps
- Seizures (fits) due to low calcium

Low vitamin D may be linked to other health problems such as: a higher risk of bowel cancer, heart disease, problems with immunity (how the body fights infections) and autoimmune diseases (e.g. diabetes).

Vitamin D supplementation

Routine supplementation with Vitamin D (400units daily) is recommended for all pregnant women.

This can be achieved by a vitamin D supplement which may be purchased from a community pharmacy without a prescription e.g.

- 0.2ml Ostelin Vitamin D Liquid® (1,000 units/0.5ml) or
- half tablet of OsteVit-D® (equivalent to 500 units)

You may be taking a pregnancy multivitamin already, however the vitamin D content varies so you may need additional supplementation. The vitamin D content of commonly used pregnancy multivitamins is as follows:

- Blackmores Pregnancy & Breastfeeding Gold
  - 500units per capsule = 1000 units/day (i.e. 2 tablets)
- Elevit Pregnancy Multivitamin
  - 200 units per tablet = 200 units/day
- Swisse Pregnancy + Ultivite
  - 600units per capsule = 600 units/day

Further Information

1. Well for Life
https://www.betterhealth.vic.gov.au/health/HealthyLiving/vitamin-d

2. NHMRC Nutrient Reference Values for Australia and NZ Vitamin D
www.nrv.gov.au/nutrients/vitamin-d

For more information

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Fact Sheet

Vitamin D Insufficiency / Deficiency in Pregnancy

About Vitamin D

Vitamin D is needed to keep bones healthy and strong.

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- Some (10%) vitamin D comes from food such as oily fish, meat, milk and eggs.

What happens if you do not have enough vitamin D?

Many people with low vitamin D do not have symptoms.

Vitamin D deficiency can cause:

- Rickets (soft bones) in children
- Muscle cramps
- Seizures (fits) due to low calcium

Low vitamin D may be linked to other health problems such as: a higher risk of bowel cancer, heart disease, problems with immunity (how the body fights infections) and autoimmune diseases (e.g. diabetes).

Vitamin D supplementation

Supplementation with vitamin D (1000units) is recommended for women with risk factors or whose vitamin D level is known to be low.

This can be achieved by a vitamin D supplement which may be purchased from a community pharmacy without a prescription e.g.

- 0.5mL Ostelin Vitamin D Liquid® (1,000 units/0.5mL) or
- One tablet of OsteVit-D® (1,000 units) or
- One capsule of Ostelin Vitamin D (1,000 units)

You may be taking a pregnancy multivitamin already, however the vitamin D content varies so you may need additional supplementation. The vitamin D content of commonly used pregnancy multivitamins is as follows:

- Blackmores Pregnancy & Breastfeeding Gold
  - 500units per capsule = 1000 units/day (i.e. 2 tablets)
- Elevit Pregnancy Multivitamin
  - 200 units per tablet = 200 units/day
- Swisse Pregnancy + Ultivite
  - 600units per capsule = 600 units/day

Further Information

1. Well for Life
https://www.betterhealth.vic.gov.au/health/HealthyLiving/vitamin-d

2. NHMRC Nutrient Reference Values for Australia and NZ Vitamin D
www.nrv.gov.au/nutrients/vitamin-d

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Parent Information

Vitamin D Deficiency in Babies

About Vitamin D

Vitamin D is needed to keep bones healthy and strong.

- Most (90%) vitamin D comes from exposing your skin to the sun. A balance of sun exposure and sun protection is needed to make enough Vitamin D.
- Some (10%) vitamin D comes from food such as oily fish, meat, milk and eggs.

What happens if you do not have enough vitamin D?

Many people with low vitamin D do not have symptoms.

Vitamin D deficiency can cause:

- Rickets (soft bones) in children
- Muscle cramps
- Seizures (fits) due to low calcium

Low vitamin D may be linked to other health problems such as: a higher risk of bowel cancer, heart disease, problems with immunity (how the body fights infections) and autoimmune diseases (e.g. diabetes).

Breast Feeding

Breast feeding is the best way to feed your baby. Breast feeding is important for your baby's health and wellbeing. You can still breast feed your baby if your Vitamin D level is low.

Vitamin D Supplementation for Babies

All breastfed and formula fed babies born to mothers who have had persistently low vitamin D levels in pregnancy or who are at risk of vitamin D deficiency (e.g. due to darker skin colour, veiled), should be given a 400 units daily vitamin D supplement for the first 12 months of life. The preparations used in SA hospitals are Ostelin Vitamin D Liquid® (1,000units/0.5mL) and Penta-vite Infant Drops®.

Ostelin Vitamin D Liquid (1,000units/0.5mL)

Ostelin Vitamin D Liquid® contains vitamin D. The dose is 0.2mL daily, and it is the preferred vitamin D liquid in term babies as it tastes better than Penta-vite Infant Drops®. You can buy a bottle of Ostelin Vitamin D Liquid® from your local chemist.

Penta-vite Infant Drops

Penta-vite Infant Drops® contain vitamins A, B1, B2, B3, B6, C and D. The dose is 0.45mL daily. You can buy a bottle of Penta-vite Infant Drops® from your local chemist.

Further Information

Speak with your GP (General Practitioner) if you have any questions about your or your baby's Vitamin D levels.

1. Well for Life
https://www.betterhealth.vic.gov.au/health/HealthyLiving/vitamin-d
2. NHMRC Nutrient Reference Values for Australia and NZ Vitamin D
www.nrv.gov.au/nutrients/vitamin-d

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