Endokrynologia Polska/Polish Journal of Endocrinology
Tom/Volume 61; Numer/Number 2/2010
ISSN 0423–104X

Prophylaxis of vitamin D deficiency — Polish Recommendations 2009

Profilaktyka dotycząca niedoborów witaminy D — polskie zalecenia 2009

Abstract

Adequate vitamin D intake and its status are important not only for bone health and Ca-P metabolism, but for optimal function of many organs and tissues throughout the body. Due to documented changes in dietary habits and physical activity levels, both observed in growing children and adults, the prevalence of vitamin D insufficiency is continuously increasing. National consultants and experts in the field have established some Polish recommendations for prophylactic vitamin D supplementation in infants, toddlers, children, and adolescents as well as in adults, including pregnant and lactating women basing on a review of current literature.

(Pol J Endocrinol 2010; 61 (2): 228–232)

Key words: *vitamin D, prophylaxis*

Streszczenie

Odpowiedni stan zaopatrzenia ustroju w witaminę D jest istotny nie tylko dla prawidłowego funkcjonowania układu szkieletowego i utrzymania homeostazy wapniowo-fosforanowej, ale również funkcji wielu innych narządów i tkanek w naszym organizmie. W związku ze zmianą stylu życia obejmującą zmianę nawyków żywieniowych, powszechne stosowanie filtrów UV oraz mniejszą aktywność na świeżym powietrzu obserwuje się wzrost odsetka niedoborów witaminy D w populacji zarówno wieku rozwojowego, jak i u osób dorosłych. Opierając się na wynikach najnowszych badań naukowych, zespół ekspertów przedstawia polskie zalecenia dotyczące profilaktycznej podaży witaminy D u niemowląt, dzieci, młodzieży i dorosłych, w tym kobiet ciężarnych i karmiących piersią.

(Endokrynol Pol 2010; 61 (2): 222–232)

Słowa kluczowe: *witamina D, profilaktyka*

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Introduction

There is a great deal of concern about the continuously increasing prevalence of vitamin D insufficiency in different age groups in the Polish population [1–3]. Vitamin D deficiency may cause not only rickets, osteomalacia, and osteoporosis but also may increase risk of many others diseases, *e.g.* diabetes, cancers (breast, colon, prostate), autoimmunological disease (multiple sclerosis, rheumatoid arthritis, lupus), cardiovascular diseases, and metabolic syndrome [3]. Taking into consideration pleiotropic vitamin D action and safety aspects, maintaining appropriate vitamin D status is a crucial issue.

Serum 25- hydroxyvitamin D level (25-OHD — the main circulating vitamin D metabolite — is used to classify vitamin D status. Serum 25-OHD levels of 20––60 ng/mL (50–150mmol/L) in children and 30–80 ng/mL (75–200 nmol/L) in adults are considered optimal [3–8].

Adequate vitamin D and calcium supply (Table I) as well outdoor physical activity are essential for appropriate bone growth and mineralization, and civilization diseases risk reduction. A diversified diet rich in food containing large amounts of calcium and vitamin D including milk, dairy products, and fish is extremely important (Tables II, III). If dietary vitamin D and calcium consumption are insufficient, the use of pharmacological preparations are essential.

Exposure to sunlight—inducing vitamin D production in the skin—is the main endogen source of vitamin D in the body. Importantly, the sunscreens which are widely used nowadays may reduce skin synthesis by 90% [3, 9]. In Poland, skin synthesis is effective from April to September if there is exposure of 18% of the body surface to the sun (uncovered forearms and partly uncovered legs) without using sunscreen for 15 minutes a day between 10 a.m. and 3 p.m. [6, 10]. There is no skin synthesis from October to March [3, 6, 10]. We should balance the advantages and disadvantages of sun exposure providing appropriate vitamin D status, at least during summer, but also being a potential risk factor of skin cancer. Direct exposure to the sun is not recommended for infants below 6 months of age [3,4].

Table I. *Calcium supply (sufficient intake) in age groups [7]*

Tabela I. *Podaż wapnia (wystarczające spożycie) w grupach wiekowych [7]*

	Age Grupa wiekowa	Calcium (mg/day) Wapń (mg/d.)
Infants Niemowlęta	0–6 months 0–6 miesięcy	300
	6–12 months 6–12 miesięcy	400
Children Dzieci	1–3 years 1–3 lata	500
	4–6 years 4–6 lat	700
	7–9 years 7–9 lat	800
Adolescents Nastolatki	10–18 years 10–18 lat	1300
Adults Dorośli	19–50 years 19–50 lat	1000
	> 50 lat > 50 years	1300
Women (pregnancy, lactation) Kobiety (ciąża i laktacja)	< 19 years > 19 years < 19 lat > 19 lat	1300 1000

Table II. *Foods with calcium content (240 mg) equal to one medium glass of milk [8]*

Tabela II. *Produkty żywnościowe odpowiadające pod względem zawartości wapnia (240 mg) jednej średniej szklance mleka [8]*

One cup of yoghurt Jeden mały kubeczek jogurtu (150 g)
One cup of kefir Jedna szklanka kefiru
One cup of buttermilk Jedna szklanka maślanki
35dkg cottage cheese 35 dkg sera białego
4–5 pancakes with cottage cheese 4–5 naleśników z serem
Two small pieces of processed cheese Dwa małe „trójkąciki" serka topionego
Two slices of hard cheese Dwa plasterki sera żółtego

Table III. *Vitamin D content of foods [8]*

Tabela III. *Zawartość witaminy D w polskich produktach żywnościowych [8]*

Food Produkt	Vitamin D content Zawartość witaminy D
Fresh eel Węgorz świeży	1200 IU/100 g
Pickled herring Śledź marynowany	480 IU/100 g
Herring in oil Śledź w oleju	808 IU/100 g
Fresh cod Dorsz świeży	40 IU/100 g
Boiled/backed salmon Gotowany/ pieczony łosoś	540 IU/100 g
Boiled/baked mackerel Gotowana/pieczona makrela	152 IU/100 g
Canned fishes (tuna, sardines) Ryby z puszki (tuńczyk, sardynki)	200 IU/100 g
Egg yolk Żółtko jajka	54 IU/żółtko
Cheese Ser żółty	7,6–28 IU/100 g
Breast milk Pokarm kobiecy	1,5–8 IU/100 mL
Cows' milk Mleko krowie	0,4–1,2 IU/100 mL
Milk-corny gruels Kaszki mleczno-zbożowe	160–480 IU/100 g (64–80/100 mL)
Infant formula (Beginning formula) Mleko początkowe	40–50 IU/100 mL
Infant formula (Follow-up formula) Mleko następne	40–80 IU/100 mL
Formula for children >1 year of age Mleko modyfikowane > 1rż.	70–80 IU/100 mL

Recommendations

1. Term newborns
   - all newborns should be supplemented with 400 IU/d of vitamin D beginning from the first few days of life
2. Preterm newborns
   - vitamin D supplementation should be introduced from the first few days of life (if enteral feeding is possible) and followed up to the corrected age of 40 weeks post conception;
   - total vitamin D intake from all sources should be 400–800 IU/day [5, 11, 12] (in the case of formula feeding or breast milk with fortifier feeding, the regimen take into account vitamin D intake from the diet);
   - subsequent (beyond 40 weeks post conception) vitamin D dose should be 400 IU/d, as in term infants.
3. Term infants
   - breastfed infants should be supplemented with 400 IU/d of vitamin D*

*Breastfeeding mother supplementation with vitamin D up to 2000 IU/d does not require any change in the infant's vitamin D dosage [13, 14]

- formula fed infants should be supplemented with 400 IU/d of vitamin D (total intake from diet and supplements).
- if formula consumption ensures 400 IU/d (about 1000 mL of beginning formula and about 700–800 mL of follow-up formula), additional vitamin D supplementation is not necessary.
- in the case of mixed feeding (mother's milk and formula milk), the dosage of vitamin D should be defined by a physician, taking into account vitamin D intake from the formula. Vitamin D intake from human milk may be omitted because of its very low vitamin D concentration (about 50 IU/L).

4. Children and adolescents (2–18 years)

- total vitamin D intake from all sources (diet and/or supplements) should be 400 IU/d between October and March, and throughout the whole year in the case of inadequate vitamin D skin synthesis during the summer time;
- in overweight/obese children, supplementation with a higher dosage of vitamin D 800–1000 IU/d should be considered.

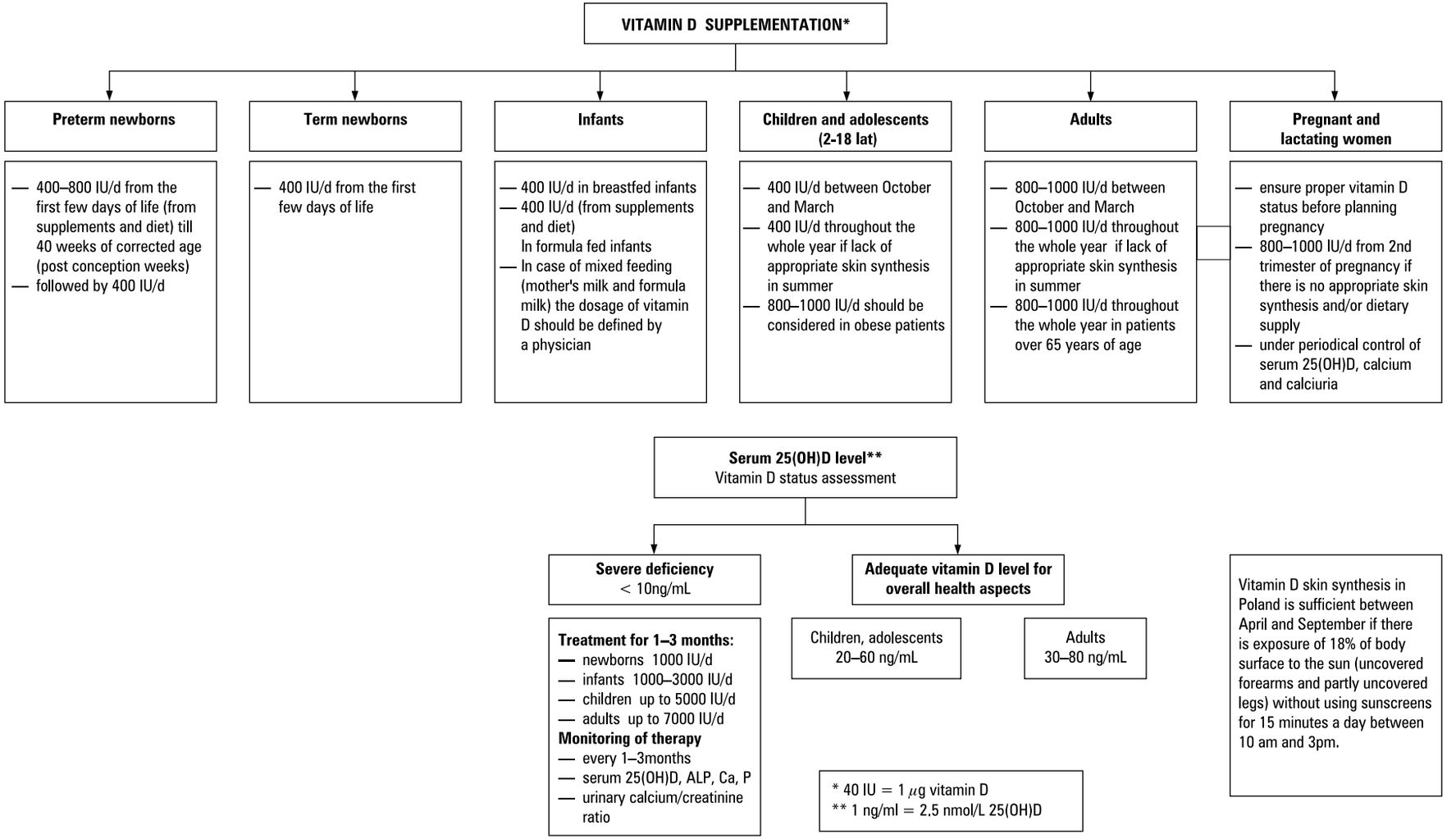
5. Adults

- total vitamin D intake from all sources (diet and/or supplements) should be 800–1000 IU/day between October and March, and throughout the whole year in the case of inadequate vitamin D skin synthesis during the summer time.
- in patients over 65 years of age, due to reduced skin synthesis and the evidenced anti-fracture and anti-fall effect, supplementation with 800–1000 IU/d of vitamin D throughout the year is recommended.

6. Pregnant and lactating women

- it is important to ensure proper vitamin D resources before planning pregnancy;
- vitamin D intake in a dose of 400 IU/d (equal to that derived from multivitamin supplements for preg-

Vitamin D supplementation schedule of prophylaxis and treatment



nant/lactating women) is not sufficient to build appropriate vitamin D status in pregnant/lactating women and their offspring [3–5, 14];
- supplementation with 800–1000 IU/d of vitamin D beginning in the second trimester of pregnancy is recommended in cases of inadequate intake from diet and/or skin synthesis;
- determination of vitamin D status should be considered by measurements of serum 25(OH)D level to define the optimal dosage and assess the efficacy of supplementation. The goal of the supplementation is to obtain and maintain 25-OHD level > 30 ng/mL. Monitoring of serum calcium and its urinary excretion should be also considered;
- some authors emphasize the need for vitamin D supplementation with more than 1000 IU/d [3–5, 13, 14].

7. Treatment of severe vitamin D deficiency [6, 8, 9]

- Severe vitamin D deficiency (25-OHD < 10 ng/ml) requires treatment dosage for 3 months.
- < 1month of age — 1000 IU/d;
- 2-12 months of age — 1000-3000 IU/d;
- Children >1 year of age — 5000 IU/d;
- Adults — up to 7000 IU/d;
- Serum 25-OHD, alkaline phosphatase activity, calcium, and calciuria should be assessed every 1–3 months.

A summary of current recommendations is summarized in the algorithm.

Attention!

The Recommendation Committee underlines the lack of substantive background to change vitamin D dosage, taking into account exclusively the crown of the head, delayed dentition, delayed appearance of nucleuses of ossification in the head of the femur, craniotabes, and excessive sweating. Craniotabes in healthy infants receiving recommended vitamin D dose does not allow the diagnosis of rickets. Craniotabes could be secondary to excessive phosphate supply in the diet and are also seen in completely healthy infants with high body weight gains. If there is any doubt about vitamin D status, assessment of calcium–phosphorus homeostasis and 25-OHD levels should be assayed. If rickets is suspected, radiogram of the wrist should be done additionally.

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