

Calcium and vitamin D supply in Polish population – facts and myths

Andrzej Lewiński¹, Elżbieta Skowrońska-Józwiak¹

¹ Department of Endocrinology and Metabolic Diseases, Polish Mother's Memorial Hospital – Research Institute, Medical University of Lodz, Poland

Traditionally, calcium and vitamin D are treated as partners crucial for bone health. In the human body calcium is located mostly in the skeleton, only 1–2% is present in body fluids and this part is metabolically active. Serum calcium concentration is closely regulated within a narrow physiological range [1]. However, calcium is responsible not only for bone mineralization but also for muscular and neural conductivity and blood coagulation [1]. Vitamin D is necessary for calcium absorption, through amplification of calbindin synthesis, it is also involved in the regulation of parathyroid hormone synthesis [1, 2]. Recently, the pleiotropic effects of vitamin D have become the subject of interest [1, 2]; potential extraskeletal benefits of vitamin D intake include lower cardiovascular morbidity and mortality, reduced risk of diabetes mellitus, breast and colon cancer, multiple sclerosis, allergy, asthma and cognitive illness [1, 2, 3].

Calcium and vitamin D deficiency may lead to secondary hyperparathyroidism which results in the development of rickets and low peak bone mass in children and processes of osteomalacia and osteoporosis in adults [2]. Low vitamin D status in women is associated with impaired fertility [4], adverse pregnancy outcomes, such as miscarriage, preeclampsia and preterm birth, development of gestational diabetes and bacterial vaginosis [4, 5]. Vitamin D deficiency in pregnant women may affect their offspring, because there is a strong correlation between maternal and cord blood 25(OH)D and newborns have inadequate vitamin D storage to draw on in early life [6]. Vitamin D affects more than 3,000 genes, many of which have a role to play in foetal development [7], supporting hypothesis on the role of vitamin D in foetal programming, influencing the genomic programming of foetal and neonatal development, and subsequent disease risk of respiratory infections and asthma, type-1 diabetes and schizophrenia in both childhood and adult life [8, 9]. Rickets, low bone mineral density and reduced postnatal linear growth and weight gain may also occur, particularly if the postnatal supplementation of vitamin D is not sufficient [9].

Diet is the main source of calcium for humans and dairy products are the richest in calcium. On the contrary, a diet that includes fatty fish, beef liver and egg yolk provides only about 10% of vitamin D demand. Most vitamin D comes from skin synthesis.

The main reason for vitamin D deficiency in Poland is climate conditions, which are appropriate for vitamin D synthesis only between April – September [10]. Moreover, other limitations of skin synthesis, such as using sun screens, living indoors, or air pollution may also play a role in the pathogenesis of vitamin D deficiency. Many studies confirm low vitamin D concentrations and low calcium intake in

the Polish population. 51% of children were affected by chronic dietary calcium deficiency, consuming only half of the recommended dose of calcium [11]. In 99% of children, chronic deficiency in vitamin D was documented [11]. In adults, low calcium intake was shown in 6.2–50% of women and in 14–37.4% of men [12, 13, 14], which was confirmed by EPOLOS study [15], HAPIEE study (Health, Alcohol and Psychosocial factors in Eastern Europe) [16] and RACPOL study [17]. Hence, in spite of the differences in climate condition, the phenomenon of calcium and vitamin D deficiency is widespread, as it has been observed both in Europe [18] and the United States of America [19].

More than a half of the Polish population over the age of 50 declared a calcium intake of less than 1000 mg daily [15]. The greatest calcium deficiency was demonstrated in the oldest age groups, in which demand is the greatest [15]. The problem of vitamin D deficiency affects also the population of pregnant women [20, 21]. Even taking supplements did not equalize calcium and vitamin D requirements [15, 20, 21]. It is worth noting that the use of calcium and vitamin D supplements is less popular in Poland than in other countries [15, 16, 21]. Moreover, the important issue is the low amount of vitamin D in supplements available on the Polish market, most of which contain only 400 IU of vitamin D, which is less than the Polish recommendation for adults. Despite this fact, the information on supplements claims that they provide 100% of daily intake demand.

Recently, some data has appeared on the adverse effects of the use of calcium supplements, including an increased risk of myocardial infarction, when administered without vitamin D [22] and a higher risk of kidney stones [23]. This is why a task force statement by the American Society for Bone and Mineral Research (ASBMR) 'Vitamin D and Calcium Supplementation to Prevent Fractures in Adults' [24] suggests that there is not enough evidence for recommendation of calcium supplements for men and premenopausal women to protect them from bone fractures. The statement advises food as the best source of calcium. The recommendation of taking calcium supplements is directed at the population of the elderly, especially those with high risk for fractures in assisted living and nursing home facilities. Moreover, optimization of calcium intake in the diet may also have other aspects apart from osteoporosis protection, since low calcium in the human diet may also contribute to dyslipidemia, increased adiposity, hypertension and insulin resistance [25]. More efforts should be made to change the diet styles of the Polish population to increase calcium intake in the healthiest way – by food consumption.

Nowadays, great progress is being made in Poland since the development of guidelines for the use of vitamin D in the Central European population [10]. Unfortunately, despite available recommendations, the daily vitamin D intake is

Address for correspondence: Andrzej Lewiński, Department of Endocrinology and Metabolic Diseases, Polish Mother's Memorial Hospital – Research Institute, ul. Rzgowska 281/289, 93-338 Lodz, Poland

rigorously preserved only during the first months of life; later, vitamin D is given only occasionally. At present, there is a need to provide the realization of those recommendations. There is a need for multi-educational activities aimed at the public, as well as various specialists and doctors. A practical model of supplementation should be developed, with increased doses of vitamin D supplements. The greatest attention should be focused on the population with the highest risk of calcium and vitamin D deficiency – children, pregnant women and the elderly.

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