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Evidence of low vitamin D intake and suboptimal 25-hydroxyvitamin D status in adolescent females: data from a 3-year longitudinal study on bone health

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Vitamin D deficiency has been associated adversely with health outcomes. There is no dietary reference value for vitamin D for the age-group 4–64 years as it is considered that UVB exposure from sunlight provides sufficient quantities. There is now overwhelming evidence of widespread vitamin D insufficiency in the general population. The optimum levels of serum 25-hydroxyvitamin D (S-25(OH)D) for adult health are considered to be 75–80 nmol/l, but the levels required for children and adolescents to maintain optimal peak bone mass (PBM) are not clear(1).

The effects of nutrition and exercise on PBM development were investigated in young female gymnasts (G) and non-gymnasts (C)(2). The initial baseline data for this 3-year longitudinal study are reported here. Dietary intake was assessed using estimated dietary records (7 d at baseline) and analysed using Diet 5 for Windows (version 2000; Robert Gordon University, Aberdeen, UK). Blood samples were collected during the month of October and S-25(OH)D, plasma parathyroid hormone (P-PTH), serum Ca (S-Ca) and serum albumin (S-alb) were determined at baseline. Data for anthropometric measurements, pubertal maturation, bone mass and bone metabolism markers were also collected and reported previously(1).

	G (*n* 38)		C (*n* 46)	
	Mean	SD	Mean	SD
Age (years)	11.2	2.2	11.5	1.8
Height (m)	1.36[a]	0.1	1.49[b]	0.1
Weight (kg)	31.1[a]	7.9	41.7[b]	11.4
Vitamin D intake (μg/d)	2.6	1.8	2.4	1.3
S-25(OH)D (nmol/l)	46.6[a]	16.0	55.9[b]	17.2
P-PTH (pmol/l)	2.3	1.0	2.1	0.9
S-Ca (mmol/l)	2.2[a]	0.06	2.3[b]	0.05
S-alb (g/l)	46.4[a]	1.7	45.3[b]	1.8

[a,b]Means within rows with unlike superscript letters were significantly different (*t* test, $P<0.05$).

Dietary intakes of vitamin D and Ca were similar for both groups. Group G had significantly lower S-25(OH)D and S-Ca (all $P<0.01$) than group C, but no difference was found for P-PTH. S-25(OH)D levels <40 nmol/l (indicative of suboptimal vitamin D status) was found in 34 % of group G and 20 % of group C. There was a weak but significant Pearson correlation between dietary intake of vitamin D and S-25(OH)D for all subjects (r 0.3, $P<0.02$) and for group G (r 0.5, $P<0.01$), but not for the group C. A negative correlation was found between S-25(OH)D and P-PTH (r −0.3, $P<0.02$).

These results indicate a prevalence of suboptimal vitamin D status in young British females. Group G have previously been reported to have greater bone mass than group C(1). The finding of lower S-25(OH)D for group G but similar P-PTH compared with group C suggests that high-impact training may have independent bone-building effects through force loading, which may override other negative effects such as low S-25(OH)D status, thus allowing for optimal PBM development.

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1. Holick MF (2004) *Am J Clin Nutr* **80**, suppl., 1678S–1688S.
2. Nurmi-Lawton JA, Baxter-Jones A, Mirwald R *et al.* (2004) *J Bone Miner Res* **19**, 314–322.