

Effect of body composition on vitamin D response to supplementation in healthy adults

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Alterations in the vitamin D endocrine system may occur in the obese state^(1,2). Some studies have observed an inverse relationship between BMI and vitamin D status⁽³⁾ and reported that vitamin D (as a fat-soluble vitamin) may get 'locked' in the adipose tissue⁽⁴⁾. More recent research suggests that BMI may also influence the response to vitamin D supplementation⁽⁵⁾. The aim of the present study was to investigate the effect of body composition on serum 25-hydroxycholecalciferol (S-25(OH)D₃) response to supplementation in young adults. Healthy volunteers aged 20–40 years (*n* 237) were randomised to receive 5, 10 or 15 µg cholecalciferol or placebo daily for 22 weeks during the winter months (October–March). A fasting blood sample, obtained at baseline and post intervention, was used to measure S-25(OH)D₃ concentration. Anthropometric measurements included height, weight, waist circumference, and percentage body fat (calculated from four-site skinfold thickness measurements). Fat and fat-free mass (kg) were then calculated and adjusted for height to give fat mass index (kg fat mass/m²) and fat-free mass index (kg fat-free mass/m²) respectively. At baseline S-25(OH)D₃ was not significantly different between males and females (77.7 nmol/l v. 74.6 nmol/l; *P*=0.27); however, as a result of gender differences in body composition, data for men and women were analysed separately.

	Males (<i>n</i> 111)			Females (<i>n</i> 110)		
	β	95% CI	<i>P</i> *	β	95% CI	<i>P</i> *
Weight (kg)	-0.27	-0.60, 0.07	0.12	-0.18	-0.44, 0.72	0.16
BMI (kg/m ²)	-0.27	-0.65, 0.12	0.18	-0.21	-0.49, 0.06	0.13
Waist circumference (cm)	-0.24	-0.75, 0.27	0.36	-0.31	-0.65, 0.04	0.08
Fat mass (kg)	-0.16	-0.30, -0.02	0.03	-0.10	-0.24, 0.04	0.15
Fat mass (%)	-0.23	-0.43, -0.02	0.03	-0.16	-0.42, 0.10	0.22
Fat mass index (kg/m ²)	-0.16	-0.31, -0.01	0.04	-0.11	-0.25, 0.04	0.14
Fat-free mass (kg)	-0.17	-0.57, 0.23	0.40	-0.20	-0.55, 0.15	0.27
Fat-free mass index (kg/m ²)	-0.13	-0.61, 0.35	0.60	-0.25	-0.64, 0.15	0.22
Fat:fat free mass (%)	-0.19	-0.34, -0.02	0.03	-0.12	-0.29, 0.06	0.20

* Negatively associated with post-intervention S-25(OH)D₃ (analysis of covariance (ANCOVA), *P*<0.05), including baseline S-25(OH)D₃, age and treatment group as covariates in each model.

In men ANCOVA showed that fat mass (kg or %), fat mass index and percentage fat:fat-free mass were inversely associated with post-intervention S-25(OH)D₃, after controlling for baseline S-25(OH)D₃, age and treatment group. Weight, BMI, waist circumference or fat-free mass were not associated with the S-25(OH)D₃ response to supplementation in men. Body composition did not significantly influence the S-25(OH)D₃ response to supplementation in women.

In conclusion, adiposity appears to impair S-25(OH)D₃ response to supplementation in healthy young men (20–40 years). These results also highlight the importance of measuring body fatness, rather than using BMI or waist circumference alone, and appropriately adjusting for body size when examining the associations between vitamin D status and adiposity.

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