

# Determinants of high vitamin D status in physically active elderly

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## Background

Elderly are at risk for vitamin D deficiencies, which can be caused by inadequate UV exposure or poor dietary intake. Generalized vitamin D supplementation guidelines have been developed to prevent and treat deficiencies in elderly. However, not much is known about the vitamin D status in physically active elderly. In the present study, we investigated the vitamin D status in 10-year subgroups of physically active elderly aged  $\geq 65$  years, and we explored determinants of vitamin D status.

## Methods

- 450 elderly aged  $\geq 65$  years recruited from Nijmegen Four Day Marches 2015-2016;
- Serum 25(OH)D concentrations determined using HPLC (n=378) or LC-MS (n=72) (no intermethod correction applied);
- Dietary vitamin D intake and physical activity were assessed using validated questionnaires;
- Statistical analyses using SPSS v22 software; regression analysis was performed to identify contributors to vitamin D status.

## Results

- Mean 25(OH)D was 90.4 nmol/L, no differences between age groups (Table 1);
- 2% of subjects were  $< 50$  nmol/L, no differences between age groups (Table 1);
- Mean dietary vitamin D intake was 4.0  $\mu\text{g}/\text{day}$ , no differences between age groups (Table 1);
- On average 12.4 hrs/week was spent on outdoor physical activities (Table 1);
- Univariate analysis: outdoor physical activity and alcohol intake are significant contributors to vitamin D status (Table 2);
- Multivariate analysis: only alcohol intake remains as significant contributor to vitamin D status (Table 2).

## Conclusions

Physically active elderly have a good vitamin D status with few deficiencies. These data suggest that physically active elderly are not at risk for a vitamin D deficiency, and do not necessarily need supplements. A more personalized supplementation strategy should take physical activity into account. More research is needed to understand the determinants of vitamin D status.

**Table 1:** Characteristics of the participants that do not use vitamin D supplements, stratified by 10 yr age groups

Variable	Total n=450	65-74 yr n=331	75-84 yr n=94	85-93 yr n=25	P-value
Age (yr)	71.9 $\pm$ 6.8	68.3 $\pm$ 2.7	80.6 $\pm$ 3.0	87.1 $\pm$ 1.9	<b>&lt;0.001</b>
Male sex	353 (78)	257 (78)	77 (82)	19 (76)	0.64
BMI (kg/m <sup>2</sup> )	25.0 $\pm$ 2.9	25.1 $\pm$ 2.9	24.9 $\pm$ 3.0	24.0 $\pm$ 2.2	0.13
Current smokers	19 (4)	18 (6)	1 (1)	0 (0)	0.10
<b>Vitamin D status</b>					
25(OH)D (nmol/L)	90.2 $\pm$ 22.5	91.0 $\pm$ 23.1	88.9 $\pm$ 20.7	85.7 $\pm$ 20.8	0.43
# 25(OH)D $\geq 50$ nmol/L	441 (98)	324 (98)	92 (98)	25 (100)	0.76
# 25(OH)D $\geq 75$ nmol/L	354 (79)	268 (81)	69 (73)	17 (68)	0.12
<b>Dietary intake</b>					
Vitamin D via nutrition ( $\mu\text{g}$ )	4.0 $\pm$ 1.9	4.1 $\pm$ 1.7	4.1 $\pm$ 2.4	3.2 $\pm$ 2.7	0.09
Alcohol (g/d)	14.4 $\pm$ 14.6	15.2 $\pm$ 14.8	12.4 $\pm$ 14.0	10.7 $\pm$ 13.1	0.13
<b>Total physical activity</b>					
Total physical activities (hr/wk)	29.1 $\pm$ 16.4	30.4 $\pm$ 16.8	25.6 $\pm$ 14.3	25.3 $\pm$ 15.8	<b>0.021</b>
Domestic work activities (hr/wk)	10.2 $\pm$ 10.7	10.3 $\pm$ 10.9	10.0 $\pm$ 10.7	8.6 $\pm$ 7.5	0.73
Leisure time activities (hr/wk)	13.1 $\pm$ 9.4	13.6 $\pm$ 9.4	11.6 $\pm$ 7.8	13.2 $\pm$ 13.1	0.20
Sportsactivities (hr/wk)	5.7 $\pm$ 6.1	6.3 $\pm$ 6.1	4.2 $\pm$ 5.1	3.5 $\pm$ 7.8	<b>0.002</b>
<b>Outdoor physical activity</b>					
Total physical activities outdoor (hr/wk)	12.4 $\pm$ 8.6	12.8 $\pm$ 8.8	11.3 $\pm$ 7.6	10.4 $\pm$ 8.8	0.15
Leisure time activities outdoor (hr/wk)	11.0 $\pm$ 7.9	11.4 $\pm$ 8.1	10.2 $\pm$ 7.2	10.2 $\pm$ 8.8	0.39
Sports activities outdoor (hr/wk)	1.2 $\pm$ 2.9	1.3 $\pm$ 2.8	1.2 $\pm$ 3.4	0.2 $\pm$ 0.8	0.16

Data are presented as mean  $\pm$  SD or No. (percentage) of participants  
BMI; body mass index, 25(OH)D; 25-hydroxy vitamin D.

**Table 2.** Associations between demographic and lifestyle factors (sex, age, BMI, smoking, vitamin D via nutrition, alcohol consumption and physical activity) and 25(OH)D.

Data were analyzed using linear regression with 25-hydroxy vitamin D (nmol/L) as the dependent variable.

	25(OH)D (nmol/L)	
	Univariate $\beta$ (95% CI)	Adjusted $\beta$ (95% CI)*
Age (years)	-0.15 (-0.46 – 0.16)	-0.12 (-0.44 – 0.20)
<b>Sex</b>		
Male (ref)	1.00	1.00
Female	-0.34 (-5.42 – 4.74)	-0.79 (-6.33 – 4.75)
BMI (kg/m <sup>2</sup> )	-0.70 (-1.44 – 0.03)	-0.75 (-1.52 – 0.02)
<b>Smoking</b>		
Non-smoker (ref)	1.00	1.00
Current smoker	-0.22 (-10.57 – 10.12)	-1.32 (-11.71 – 9.07)
Vitamin D via nutrition ( $\mu\text{g}$ )	0.55 (-0.57 – 1.66)	0.16 (-1.00 – 1.32)
Alcohol (g/d)	<b>0.20 (0.06 – 0.34)</b>	<b>0.19 (0.04 – 0.34)</b>
Total physical activities outdoor (hr/wk)	<b>0.25 (0.00 – 0.49)</b>	0.24 (-0.01 – 0.49)

\*Adjusted for all variables shown in the table. Bold values indicate  $\beta$  with p-value  $< 0.05$ .

BMI; body mass index, 25(OH)D; 25-hydroxy vitamin D.



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