

A case-control study of vitamin D status and asthma in adults

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The association between vitamin D, asthma and allergy remains unclear.

Beneficial associations have been reported between vitamin D and wheezing and asthma severity in children (1, 2), and ventilatory function in adults

(3). Adverse associations have been reported between vitamin D and childhood eczema and asthma (4) and allergic disease in adults (5, 6). There is interest in using vitamin D therapeutically to complement conventional asthma therapy. We conducted a case-control study of serum total 25-hydroxyvitamin D [25(OH)D] in adults with and without asthma.

Participants were recruited from the Chest Clinics and Daycase Surgery Units of Aberdeen Royal Infirmary (north-east Scotland) and the Department of Respiratory Medicine, Norfolk and Norwich University Hospital, Norfolk (south-east England), nonhospital based participants were recruited by advertising. Patients aged 18–50 years with physician confirmed mild/moderate asthma, and controls without asthma, but gender-, age- (± 5 years) and centre-matched, were recruited within a month of each other. Serum total 25(OH)D was quantified by high-performance liquid chromatography-tandem mass spectrometry. With 80

patients and 80 controls, the study was powered to detect an 18% difference in total 25(OH)D. This was based on a mean 25(OH)D of 21.6 $\mu\text{g/l}$ from women aged 40–60 years living in Aberdeen and our reported association between vitamin D and childhood wheeze (4). Dietary vitamin D intake was estimated by food frequency questionnaire. Patients taking Vitamin D supplements and/or with ≥ 10 pack-year smoking histories were excluded from participation.

The Table 1 details the 160 participants (80 asthmatics and 80 controls), 94 were recruited in Aberdeen, 66 in Norwich. There was excellent within-centre gender matching of patients and controls and good within-centre matching for age and smoking history. Differences in FEV₁ and inhaled corticosteroid dose between Aberdeen and Norwich were not statistically significant. Most participants in Norwich were recruited in the autumn/winter, whilst recruitment in Aberdeen was in the autumn/winter/spring. Serum total 25(OH)D was the lowest in the winter and spring, and lower in more northerly Aberdeen (latitude 57°N) than in Norwich (latitude 52°N) ($P < 0.001$). There was no significant difference in serum total 25(OH)D concentration between asthmatics and controls overall [10.1 $\mu\text{g/l}$ (95% CI, 8.3–11.9) vs 10.1 $\mu\text{g/l}$ (8.4–11.7), $P = 0.98$], or in Aberdeen or Norwich. There was no difference in energy adjusted dietary vitamin D intakes of asthmatics and controls overall, in Aberdeen or in Norwich. Conditional logistic regression relating case/control status to serum total 25(OH)D concentration, age, gender, smoking status, centre, body mass index and season revealed no association between asthma and serum total 25(OH)D concentration [Odds Ratio 0.98 (95% CI 0.91–1.06)]. Similar multivariable analyses demonstrated no associations between total 25(OH)D

concentrations and severity of asthma nor ventilatory function.

This case-control study conducted in two centres with differing amounts of sun exposure suggests that vitamin D status is not associated with asthma in adults aged 18–50 years. The study cannot comment on the role of vitamin D earlier in life nor in the aetiology of asthma. There was close age and gender matching of patients and controls, and contamination by misundiagnosed cases of COPD was minimized by age and smoking selection criteria. The study sample size was based on a study of women aged 40–60 years living in Aberdeen; however, the mean 25(OH)D concentration of younger participants in the present study was much lower, possibly reflecting two very poor overcast wet summers in 2007 and 2008 and/or that the younger population in this study spend less time outdoors than older generations. Although our study does not provide evidence to support an intervention study investigating the role of vitamin D as an adjunct to conventional asthma therapy, the possibility remains that some asthmatic individuals may be particularly susceptible to vitamin D because of their genotype or immunophenotype.

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Serum total 25-hydroxyvitamin D does not differ between adult asthmatics and age- and gender-matched controls.

Table 1. Summary statistics of all participants, patients and controls by centre

	Patients + controls	Patients	Controls	<i>P</i> -value
Recruited	160	80	80	
Aberdeen	94	47	47	
Norwich	66	33	33	
Age (mean 95% CI)	35.9 (34.4–37.4)	35.7 (33.6–37.8)	36.0 (33.8–38.3)	
Aberdeen	36.3 (34.2–38.3)	36.7 (33.7–40.0)	35.8 (33.0–38.7)	
Norwich	35.3 (33.0–37.5)	35.1 (31.7–38.4)	35.5 (32.2–38.7)	
Women <i>n</i> (%)	108 (60.0)	54 (60.0)	54 (60.0)	
Aberdeen	60 (63.8)	30 (63.8)	30 (63.8)	
Norwich	48 (72.7)	24 (72.7)	24 (72.7)	
BMI kg/m ² (mean 95% CI)	26.9 (26.4–25.7)	28.0 (26.4–29.6)	25.6 (24.2–27.0)	0.031
Aberdeen	27.0 (25.7–28.2)	28.1 (26.3–29.8)	25.8 (24.1–27.5)	0.066
Norwich	26.7 (24.1–29.2)	27.8 (24.0–31.5)	24.6 (24.0–31.5)	
Never smoked <i>n</i> (%)	118 (73.8)	69 (73.4)	49 (74.2)	
Aberdeen	69 (73.4)	36 (76.6)	33 (70.2)	
Norwich	49 (74.2)	26 (78.8)	23 (69.7)	
Pack year smoking (mean 95% CI)	0.95 (0.52–1.39)	1.03 (0.44–1.62)	0.89 (0.24–1.53)	
Aberdeen	1.36 (0.69–2.02)	1.12 (0.11–2.13)	1.60 (0.69–2.51)	
Norwich	0.32 (–0.01–0.64)	0.54 (–0.07–1.14)	0.05 (–0.01–0.11)	
FEV1 % predicted (mean 95% CI)	93.7 (90.3–97.2)	85.3 (80.4–90.2)	103 (99.5–107)	< 0.001
Aberdeen	92.7 (87.6–97.7)	81.8 (74.5–89.1)	104 (98.9–110)	< 0.001
Norwich	95.3 (91.4–99.3)	90.4 (84.6–96.1)	102 (96.8–106)	0.004
Inhaled corticosteroid dose (µg beclomethasone mean 95% CI)		1242 (1056–1426)		
Aberdeen		1344 (1112–1576)		
Norwich		982 (698–1266)		
Total 25-hydroxyvitamin D µg/l (mean 95% CI)	10.1 (8.9–11.3)	10.1 (8.3–11.9)	10.1 (8.4–11.7)	
Aberdeen	7.4 (5.9–9.0)	7.6 (5.3–9.9)	7.2 (5.0–9.4)	
Norwich	14.1 (12.6–15.5)	14.2 (11.7–16.6)	14.0 (12.2–15.8)	
Energy adjusted dietary vitamin D µg/d (mean 95% CI)	4.26 (3.87–4.69)	4.15 (3.59–4.79)	4.39 (3.87–4.99)	
Aberdeen	4.16 (3.71–4.67)	4.02 (3.40–4.76)	4.31 (3.66–5.08)	
Norwich	4.41 (3.73–5.22)	4.32 (3.32–5.63)	4.51 (3.64–5.60)	

P-values for patient vs control > 0.1 unless stated.

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