Seasonal 25-hydroxy Vitamin D3 variations in school-aged children from Santiago de Chile

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Introduction

The main role of Vitamin D (VitD) is the regulation of calcium, which is also regulated by the parathyroid hormone (PTH), and phosphate metabolism. The main source of the more biologically active 25-hydroxy-Vitamin D3 (25OHVitD3) comes from the action of ultraviolet light on Vitamin D precursors.

Aim

To determine if there are differences in concentrations of 25OHVitD3, calcium, PTH and alkaline phosphatase (AP) in school-aged children throughout the four seasons

Subjects and methods

- 5-8 years old children, with no Vitamin D supplementation, from different urban areas of Santiago de Chile (latitude -33.4372)
- Measurements: 25OHVitD3 (LC-MS/MS), PTH, AP and calcium (automated assays)
- Statistics: One-way ANOVA to compare the means of 25OHVitD3, PTH and calcium concentrations and the Tukey's multiple comparison test to establish if there are differences between them

Results

- 133 children were recruited during the four seasons.
- No differences in sex distribution, age, height Z-score or Body Mass Index were observed during the four seasons.

Table 1: Clinical characteristics grouped by season

	Spring (n= 29)	Summer (n= 41)	Autumn (n= 28)	Winter (n= 35)	p value
Female (%)	21 (51.2%)	9 (32.1%)	21 (60%)	14 (48.3%)	0.174
Age (years)	6.6 [5.9-7.2]	6 .6 [5.8-7.3]	6. 3 [5.3-6.9]	6.6 [5.8-7.6]	0.422
Height (SDS)	0.1 [-0.59-0.66]	-0.09 [-0.77-0.39]	-0.47 [-0.86-0.47]	-0.1 [-0.49-0.49]	0.453
BMI (SDS)	0.58 [-0.29-1.02]	0.69 [-0.07-1.38]	0.45 [-0.7- 1.64]	0.58 [-0.6- 1.53]	0.872

Fig. 1: Associations between parathormone vs 25OHVitD3 and alkaline phosphatase vs parathormone

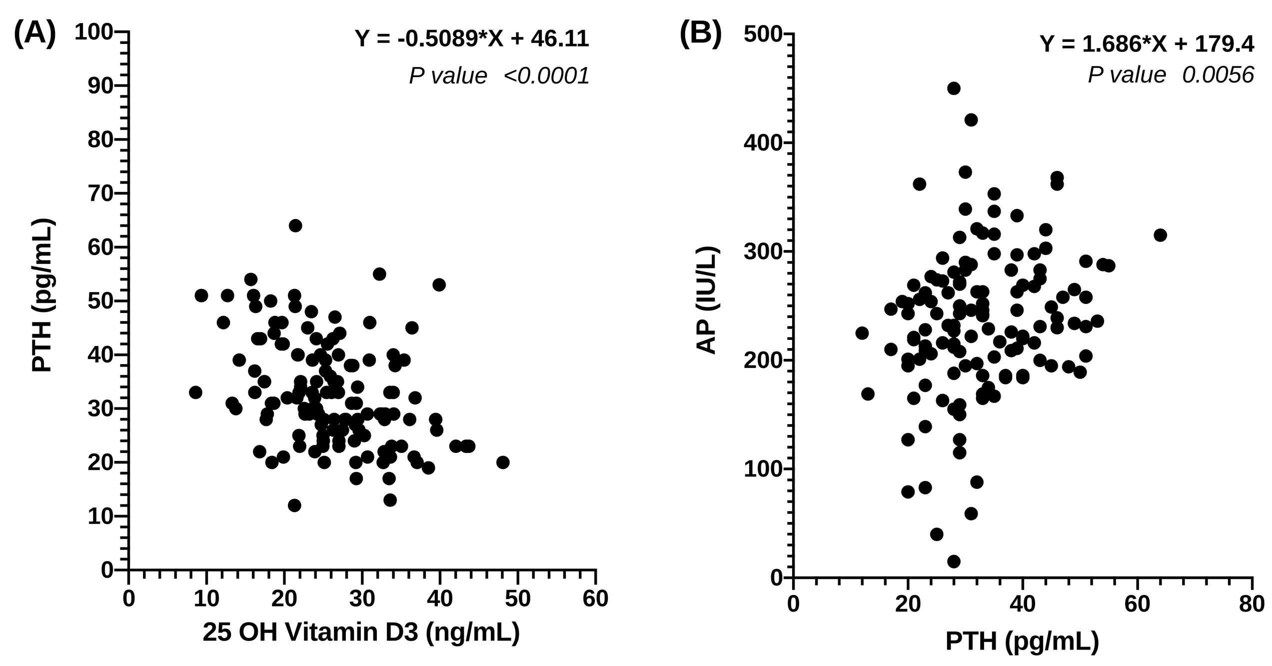


Fig. 2: 25-OH Vitamin D3, parathormone, calcemia and alkaline phosphatase concentrations grouped by season

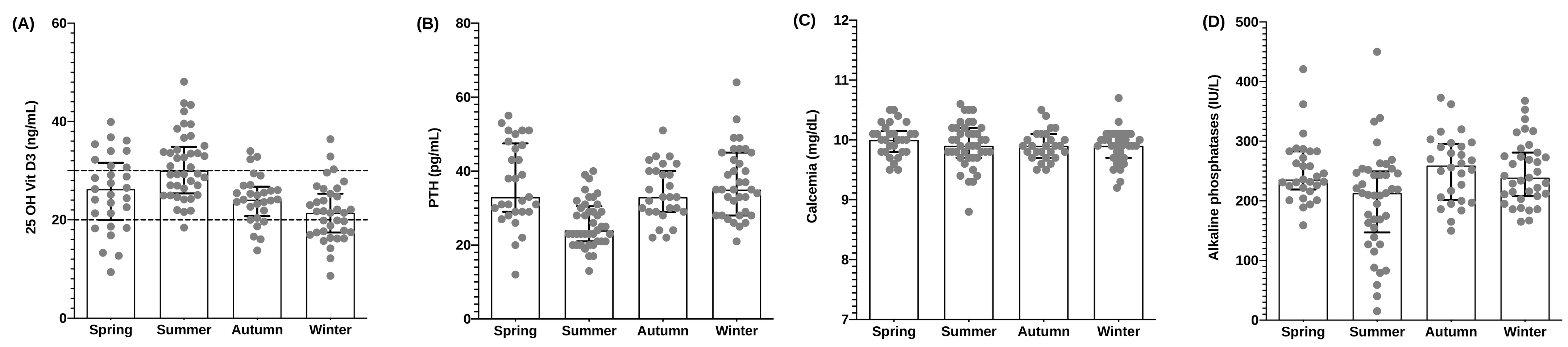
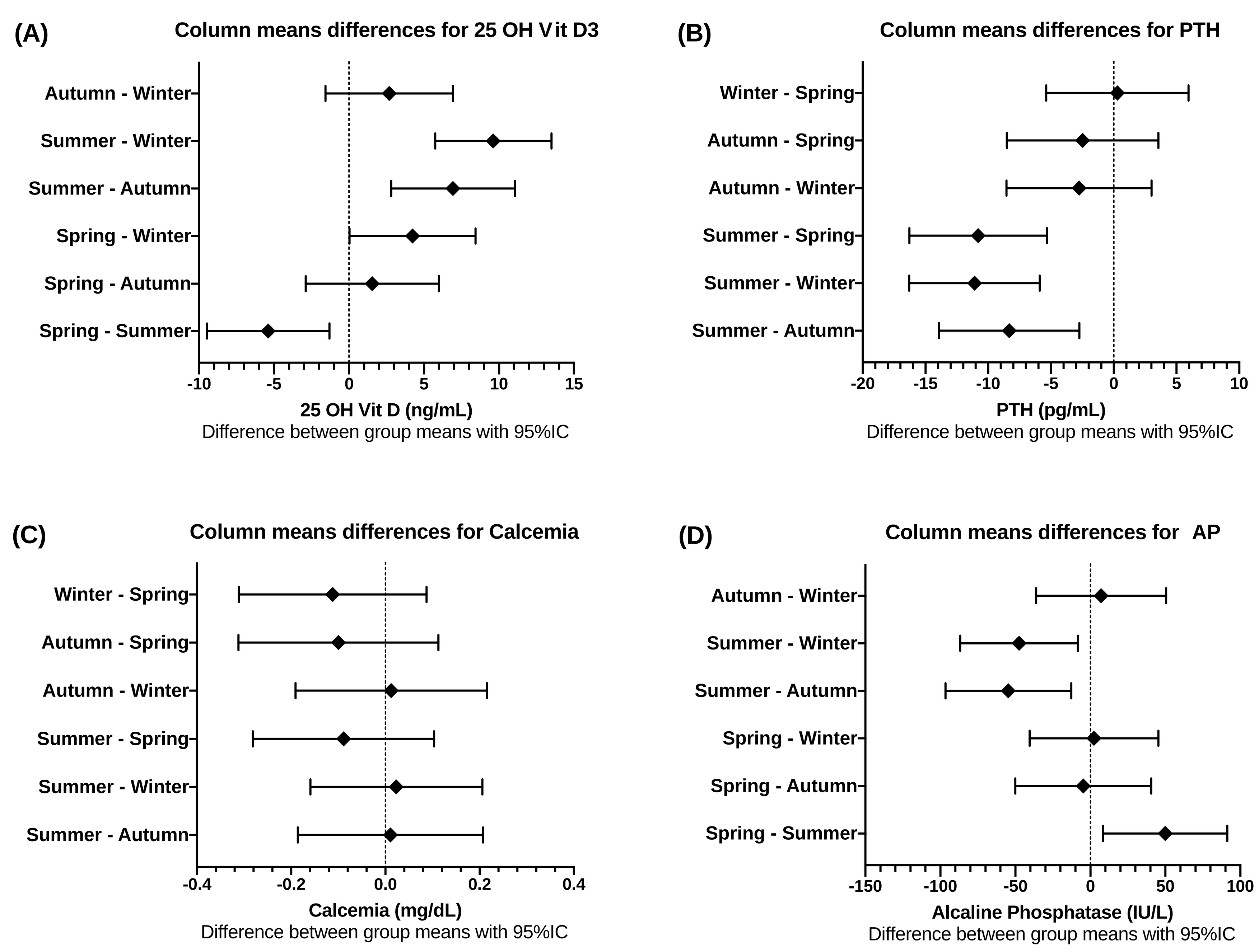


Table 2: Mean differences of 25-OH Vitamin D3, alkaline phosphatase and parathormone concentrations between summer compared with other seasons

	Summer vs/ Autumn	Summer vs/ Winter	Summer vs/ Spring
25OHVitD3 (ng/mL)	6.9 [2.8 to 11.07]***	9.6 [5.7 to 13.5]****	5.4 [1.3 to 9.5]**
AP (IU/L)	-54.7 [-96.5 to -12.8]**	-47.5 [-86.8 to -8.2]*	-49.9 [-91.4 to -8.5]*
PTH (pg/mL)	-8.3 [-13.9 to -2.7]***	-11.1 [-16.3 to -5.9]****	-10.8 [-16.3 to -5.3]****

Fig. 3: Mean differences of 25-OH Vitamin D3, parathormone, calcemia and alkaline phosphatase between seasons



- Deficiency, insufficiency and sufficiency state of *25OHVitD* also showed seasonal variation: Pearson's $\chi 2$ (6) = 36.6, p <0.001). Sufficiency percentage is significantly higher in summer (51.2%) than in autumn (10.7%, Odd ratio= 8.7, 95% CI= 2.5 to 30.0, p=0.0007) and winter (8.6%, Odd ratio= 11.2, 95% CI= 3.2 to 38.0, p<0.0001), but not different in comparison to spring (31%, p=0.141).

Conclusions

In autumn and winter, 25OHVitD3 concentrations decrease importantly, triggering an increase in PTH, in order to maintain calcium concentration. In regions where no Vitamin D supplementation is performed but where relatively prolonged winters are observed, as in Santiago de Chile and further south, reduced exposure to sunlight can lead to lower levels of vitamin D at least in school-aged children.