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The Optimal Dosage of Vitamin D Supplement for Vitamin D Deficiency in Korean Children and Adolescents

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Disclosure Statement

Seung Yang, Kyung Hee Yi, Eun Young Kim and Il Tae Hwang have no relevant financial relationships to disclose or conflicts of interest to we solve.

Introductions and Objectives

Vitamin D deficiency (VDD) is very common nowadays in children as well as in adults, probably due to decreased exposure to sunlight. In Korea, the prevalence of VDD was 47% in teenage boys and 65% in teenage girls. However, the optimal dosage regimen for correcting deficiency is unknown. We investigate the change of serum 25(OH) vitamin D concentration according to the treatment dosage and duration in VDD.

Methods

Data was collected from 1797 children and adolescents aged 0 to 16 year between August in 2017 and July in 2018, retrospectively. They were divided to 3 groups (deficiency, insufficiency, sufficiency) according to their serum 25(OH) vitamin D concentrations (less than 20, between 20 and 30, more than 30 ng/mL, respectively). There were 3 subgroups (poor, moderate, good) according the daily increase (DI) of the serum 25(OH) vitamin D concentration (less than 0.3, between 0.3 and 0.6, more than 0.6 ng/mL/day, respectively) after 4 to 6 week oral administration of 25(OH) vitamin D in children and adolescents with vitamin D deficiency.

Results

Table 1. Characteristics of study participants (n=1797)

Characteristic	n (%)
SEX	
Male	569 (31.65)
Female	1228 (68.3%)
AGE	
0-2 years	30 (1.7%)
2-6 years	107 (6.0%)
6-12 years	1424 (79.2%)
12-16 years	236 (13.1%)
Season of data collection	
Spring	458 (25.5%)
Summer	571 (31.8%)
Fall	412 (22.9%)
Winter	356 (19.8%)
Weight (SDS)	
SDS≤-2.0	44 (2.4%)
-2.0<SDS<2.0	1674 (93.0%)
SDS≥2.0	79 (4.4%)
BMI(SDS)	
SDS≤-2.0	38 (2.1%)
-2.0<SDS<2.0	1671 (92.9%)
SDS≥2.0	58 (3.2%)
Vitamin D status (serum 25(OH) D concentration [ng/mL]	
Deficient (< 20ng/mL)	1229 (68.4%)
Insufficient(20ng/mL to <30ng/mL)	511 (28.4%)
Sufficient(≥30ng/mL)	57 (3.2%)

Table 2. The characteristics of study participants according vitamin D status

Variable	Vitamin D status			
	Deficiency	Insufficiency	Sufficiency	P-value
Age(yr)	9.4±2.3	9.2±2.7	7.3±3.6	0.000
Female(%)	72.4	60.1	54.3	0.000
Weight(SDS)	0.34±1.12	0.03±1.08	-0.34±1.12	0.000
BMI(SDS)	0.30±1.08	0.01±1.02	-0.33±0.94	0.000

Values are presented as mean±standard deviation.
Deficiency : 25(OH) D level < 20 ng/mL
Insufficiency : 20ng/mL ≤ Serum 25(OH) D level < 30ng/mL
Sufficiency : Serum 25(OH) D level ≥ 30 ng/mL

Table 3. Serum 25(OH) D levels by different age group and season

Season / AGE(yr)	Spring	Summer	Fall	Winter	P-value
0-2 (n=30)	27.2±9.5	25.9±10.9	25.3±6.7	16.1±9.0	0.228
2-6 (n=107)	17.13±6.9	20.4±7.7	16.5±5.9	12.7±5.16	0.000
6-12 (n=1424)	17.1±6.9	20.4±7.7	16.5±5.9	12.7±5.2	0.000
12-16 (n=236)	16.2±6.6	19.6±5.7	15.6±6.0	16.9±6.4	0.000

Values are presented as mean±standard deviation.
Serum 25(OH) D level [ng/mL]

Table 4. The characteristics of study participants who treated oral 25(OH) Vitamin D 2000IU/day for 4-6wks (n=61)

Characteristic	n (%)
SEX	
Male	23 (35.9%)
Female	38 (59.4%)
AGE	
0-2 years	1 (1.6%)
2-6 years	3 (4.7%)
6-12 years	43 (67.2%)
12-16 years	14 (21.9%)
Weight(SDS)	
SDS≤-2.0	0 (0%)
-2.0<SDS<2.0	55 (85.9%)
SDS≥2.0	6 (9.4%)
BMI(SDS)	
SDS≤-2.0	1 (1.6%)
-2.0<SDS<2.0	57 (89.1%)
SDS≥2.0	3 (4.7%)

Table 5. The Anthropometric characteristics according Daily increase (n=61)

Variable	Response group of treatment			
	Poor (n=13)	Moderate (n=31)	Good (n=17)	P-value
Age(yrs)	10.7±1.9	9.4±2.5	9.2±2.4	0.171
Female(%)	76.9	58.1	58.8	0.47
Weight(SDS)	0.64±1.41	0.32±1.11	0.31±1.16	0.699
BMI(SDS)	0.46±1.05	0.28±1.01	0.30±1.13	0.872

Values are presented as mean±standard deviation.
Poor : Daily increase < 0.3ng/mL/day
Moderate : 0.3ng/mL/day ≤ Daily increase < 0.6ng/mL/day
Good : Daily increase ≥ 0.6ng/mL/day

Fig. 1. Relationship between Serum 25(OH) D and Weight SDS, BMI SDS

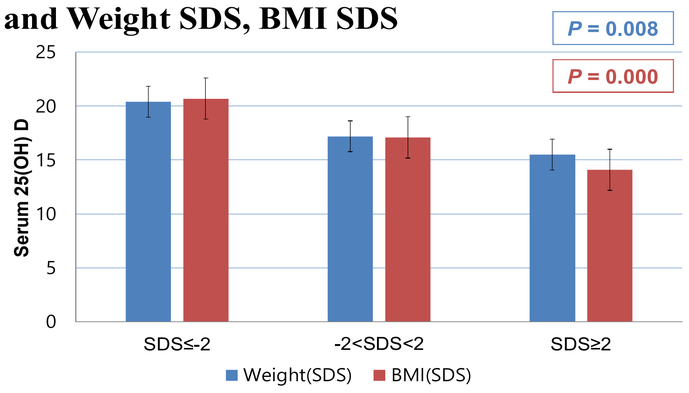


Fig. 2. Relationship between Serum 25(OH) D and Daily increase

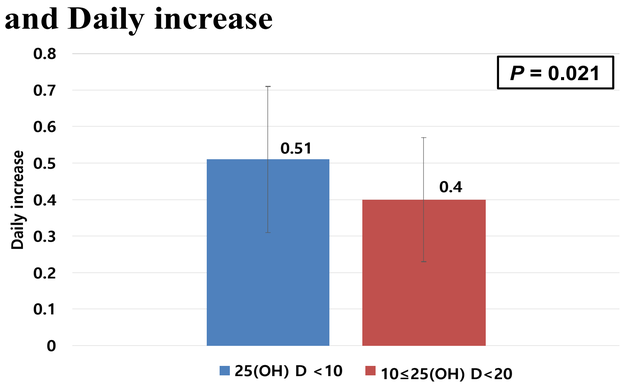
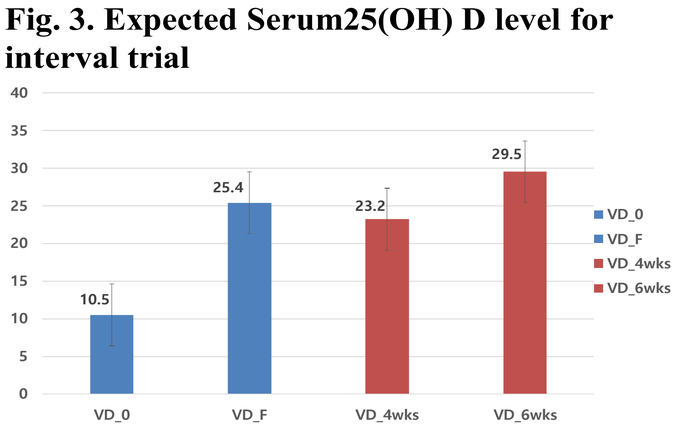


Fig. 3. Expected Serum25(OH) D level for interval trial



VD_0 : Before Treatment
VD_F : 4-6 weeks after oral 25(OH) Vitamin D 2000IU/day
VD_4wks : Expected 25(OH) D level after oral 25(OH) Vitamin D 2000IU/day for 4weeks
VD_6wks : Expected 25(OH) D level after oral 25(OH) Vitamin D 2000IU/day for 6weeks

Conclusions

The prevalence of VDD increased in female, older age, overweight and winter in Korea and the response to treatment was higher in patient with lower serum 25(OH) D concentration. It may be appropriate to take an oral 25(OH) Vitamin D with 2000 IU/day for 6 weeks in Korean children and adolescents with VDD.