

Factors affecting height velocity in normal prepubertal children

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Purpose

To analyze the effects of clinical and laboratory factors, including insulin-like growth factor (IGF) levels, on the height velocity of normal prepubertal children.

Methods

Ninety-five healthy prepubertal children (33 boys, 62 girls) were enrolled. The mean chronological age of the participants was 6.3 ± 1.4 years, with a height standard deviation score (SDS) of -0.88 ± 0.70 . IGF-1, IGF binding protein-3 (IGFBP-3), SDS for anthropometric measurements, and changes in SDS for anthropometric measurements were analyzed for one year, and their associations with one-year height velocity were investigated.

Results

The group of children with a one-year height velocity of ≥ 6 cm were chronologically younger than the group with a one-year height velocity of < 6 cm (5.9 ± 1.3 vs. 6.7 ± 1.3 years, $P=0.004$; Table 1), with a lesser increase of SDS for body mass index (BMI) over one year (-0.18 ± 0.68 vs 0.13 ± 0.53 , $P=0.014$; Table 1). There were no differences between the two groups in IGF-1 SDS and IGFBP-3 SDS. Multiple linear regression showed that baseline chronological age ($r=0.243$, $P=0.026$; Table 2) and height SDS ($r=0.236$, $P=0.030$; Table 2) were positively associated with IGF-1 SDS. Binomial logistic regression showed that an increase in chronological age (odds ratio [OR], 0.68; 95% CI, 0.47-0.99; Table 3) and an increase of BMI SDS over one year (OR, 0.41; 95% CI, 0.18-0.89; Table 3) were associated with a decreased growth possibility of an above-average height velocity (≥ 6 cm/year).

Conclusion

Height velocity of normal prepubertal children is affected by an increase of BMI SDS and chronological age. Prepubertal IGF-1 SDS reflects height SDS at the time of measurement but is not associated with subsequent height velocity.

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Table 1. Clinical and Laboratory Parameters of Normal Prepubertal Children According to Height Velocity for One Year

	HV < 6 cm/yr	HV ≥ 6 cm/yr	P value
Number	52	43	
eCA (years)	6.7 ± 1.3	5.9 ± 1.3	0.004
eBA (years)	5.8 ± 1.6	4.9 ± 1.6	0.006
MPH SDS	-0.49 ± 0.66	-0.30 ± 0.49	0.113
IGF-1 SDS	-0.31 ± 0.99	-0.20 ± 0.88	0.575
IGFBP-3 SDS	-0.41 ± 1.18	-0.25 ± 1.14	0.552
eBMI SDS	-0.37 ± 1.14	0.03 ± 0.95	0.070
Δ BMI SDS 1-0	0.13 ± 0.53	-0.18 ± 0.68	0.014
eWt SDS	-0.76 ± 1.11	-0.60 ± 0.96	0.476
Δ Wt SDS 1-0	0.27 ± 0.41	0.28 ± 0.56	0.941
eCA-eBA	0.88 ± 1.19	0.83 ± 0.15	0.150
Δ BA 1-0	1.13 ± 0.63	1.06 ± 0.56	0.590

SDS, standard deviation score; HV, height velocity; eCA, chronological age at referral; eBA, bone age at referral; MPH, mid-parental height; eWt, weight at referral; eBMI, body mass index at referral; IGF-1, insulin-like growth factor-1; IGFBP-3, insulin-like growth factor binding protein-3; Δ BMI SDS 1-0, BMI SDS change for one year; Δ Wt SDS 1-0, Weight SDS change for one year; Δ BA 1-0; Bone age change for one year

Table 2. Multiple Linear Regression Analysis for IGF-1 SDS with Factors of Normal Prepubertal Children

	IGF-1 SDS	
	r	P value
eCA	0.243	0.026
eHt SDS	0.236	0.030
eBMI SDS	0.078	0.450
MPH SDS	0.016	0.876

Note. Dependent variable : IGF-1 SDS

SDS, standard deviation score; eCA, chronological age at referral; eHt, height at referral; eBMI, body mass index at referral; MPH, mid-parental height

Table 3. A Multivariable Logistic Regression Model for Relatively Higher Height Velocity (≥ 6 cm/yr) for One Year of Normal Prepubertal Children

	Odds ratio	95% CI	P value
Δ BMI SDS 1-0	0.41	0.19 - 0.89	0.025
eCA	0.68	0.47 - 0.99	0.046
MPH SDS	1.42	0.66 - 3.06	0.365
eHt SDS	0.98	0.51 - 1.91	0.958

CI, confidence interval; SDS, standard deviation score; BMI, body mass index; Δ BMI SDS 1-0, BMI change for one year; eCA, chronological age at referral; MPH, Mid-parental height; eHt, height at referral

