

Figure S1 Illustration of the current study design.

Table S1 Odds ratios of NG by different treatment status in patients with early menarche

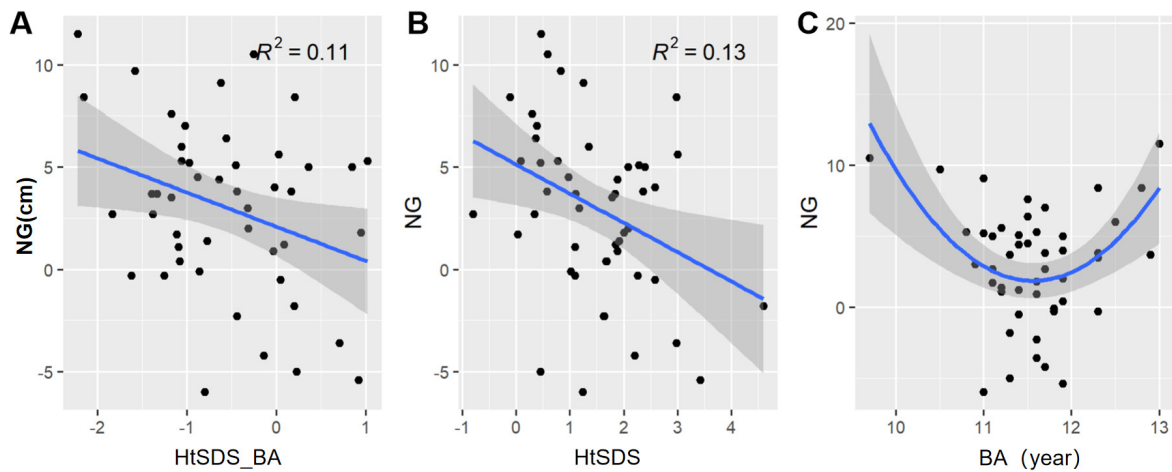
Variables	Model A		Model B		Model C	
	$\beta$ (95% CI)	P	$\beta$ (95% CI)	P	$\beta$ (95% CI)	P
(Intercept)	-0.901 (-17.423, 15.622)		0.256 (-15.282, 15.794)		0.269 (17.167, 17.705)	
Treatment		0.43		0.65		0.82
No	Reference		Reference		Reference	
Yes	1.018 (-1.532, 3.569)		0.556 (-1.87, 2.983)		0.334 (-2.558, 3.225)	

Model A: adjusted for BA and CA; Model B: Model A + HtSDS-BA, HtSDS and BMI-SDS; Model C: Model B + FSH, LH and IGF-1. NG, net gain; BA, bone age; CA, chronological age; Ht, height; SDS, standard deviation score; BMI, body mass index.

**Table S2** Univariable linear regression of NG in patients with early menarche after GnRHa treatment

Variable	Estimate Std.	Error	t value	P value
HtSDS_BA	-1.67	0.73	-2.30	<b>0.03</b>
HtSDS	-1.43	0.55	-2.62	<b>0.01</b>
BA	-73.79	19.10	-3.86	<b>&lt;0.001</b>
BA^2	3.19	0.82	3.87	<b>&lt;0.001</b>
age	0.42	0.92	0.46	0.65
BA-CA	-4.22	4.02	-1.05	0.30
(BA-CA)^2	0.85	0.92	0.92	0.36
BA/CA	-5.82	6.86	-0.85	0.40
BMR	8.54	8.97	0.95	0.35
BMR^2	-6.12	5.79	-1.06	0.30
GV	6.17	4.65	1.33	0.19
GV^2	-0.52	0.48	-1.09	0.28
IGF1	0.01	0.03	0.31	0.76
IGF1^2	0.00	0.00	-0.39	0.70
LH/FSH	-8.77	6.79	-1.29	0.20
(LH/FSH)^2	4.73	4.06	1.17	0.25

The bold P value represents  $P < 0.05$ . SDS, standard deviation score; Ht, height; BA, bone age; CA, chronological age; BMR, bone maturation ratio; GV, growth velocity; IGF-1, insulin-like growth factor 1; LH, luteinizing hormone; FSH, follicle-stimulating hormone.



**Figure S2** The polynomial curves between relevant factor ( $P < 0.05$ ) and NG. (A) HtSDS-BA; (B) HtSDS; (C) BA. NG, net gain; Ht, height; SDS, standard deviation score; BA, bone age.

**Table S3** Multiple linear regression (Model1) and multiple stepwise linear regression analysis (Model2) of NG in patients with early menarche after GnRH $\alpha$  treatment

Variable	Model1			Model2				
	Estimate	Std.	t	P	Estimate	Std.	t	P
(Intercept)	374.77		3.31	<0.001	376.65		3.45	<0.001
HtSDS_BA	-0.07		-0.08	0.94				
HtSDS	-1.04		-1.55	0.13	-1.08		-2.10	<b>0.04</b>
BA	-64.46		-3.28	<0.001	-64.80		-3.43	<0.001
BA <sup>2</sup>	2.80		3.29	<0.001	2.81		3.46	<0.001

The bold P value represents P<0.05. SDS, standard deviation score; BA, bone age; Ht, height.

**Table S4** Univariable GAM of NG in patients with early menarche after GnRH $\alpha$  treatment

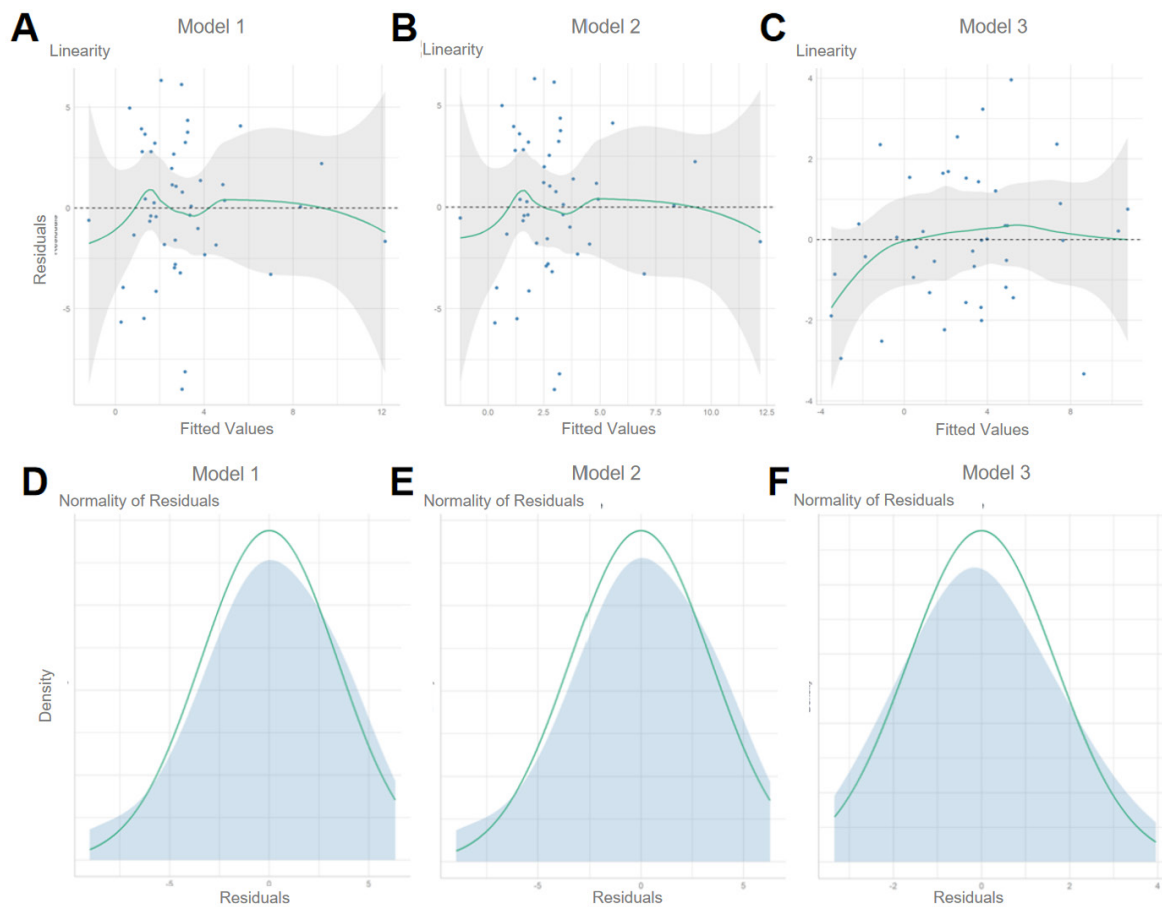
Variable	P value	Deviance explained
s(HtSDS-BA)	0.03	10.50%
s(HtSDS)	0.01	13.20%
s(BA)	0.01	26%
s(CA)	0.65	0.46%
s(LH/FSH)	0.34	17.40%
s(IGF-1)	0.64	0.59%
s(BA-CA)	0.57	1.51%
s(BA/CA)	0.54	7.93%
s(BMR)	0.52	13%
s(GV)	0.07	8.01%

GAM, generalized additive model; NG, net gain; GnRH $\alpha$ , gonadotropin-releasing hormone agonist; s, spline; Ht, height; SDS, standard deviation score; BA, bone age; CA, chronological age; LH, luteinizing hormone; FSH, follicle-stimulating hormone; IGF-1, insulin-like growth factor 1; BMR, bone maturation ratio; GV, growth velocity.

**Table S5** Comparison of prediction performance among three models

Variable	Model 1	Model 2	Model 3
Multiple R-squared	0.35	0.42	0.69
AIC	260.20	258.20	199.00
BIC	271.30	267.50	235.90

AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion.



**Figure S3** Performance of Models 1, 2 and 3. (A-C) Residual plot of Model 1, Model 2 and Model 3 (from left to right). The x-axis contains predicted value of NG in height in GnRH $\alpha$ -treated group by GAM and the y-axis contains residuals which means difference between predicted and actual response values. Green line represents the smooth curve between predicted value and residuals. Grey shaded areas are 95% confidence intervals. (D-F) Normal probability plots of residuals of Model 1, Model 2 and Model 3 (from left to right). The x-axis contains range of residual values and the y-axis contains density. Green line represents normal density. Blue area represents actual density of models. GAM, generalized additive model; NG, net gain; GnRH $\alpha$ , gonadotropin-releasing hormone agonist.