Increasing body mass index is associated with lower luteinizing hormone levels in girls with central precocious puberty at the early pubertal stage.

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INTRODUCTION

• Excess adiposity may also influence various aspects of pubertal development, such as the timing of pubertal initiation and hormonal parameters during puberty.

• The aim of the study was to evaluate the effects of obesity on luteinizing hormone secretion in response to GnRH test in girls with precocious puberty.

METHODS

• A total of 621 subjects with idiopathic precocious puberty who completed gonadotropin-releasing hormone stimulation testing between 2007 and 2012 were included in the study.

• Subjects were divided into two groups based on BMI; the normal weight group (BMI between the 5th and 85th percentile) and the obese group (BMI greater than 85th percentile).

• To compare clinical parameters according to the BMI, an independent t test was performed at each Tanner stage. Spearman's correlation was used to examine the relationship between the peak LH and BMI SDS.

Table 1. Baseline characteristics of study subjects stratified by BMI before treatment

Variable	Normal weight group	Obese group	P value
Tanner 2	(n=320)	(n=76)	
Age at onset (year)	7.27 ± 0.68	7.24 ± 0.69	0.665
Height SDS	0.83 ± 0.87	1.11 ± 0.83	0.013
Weight SDS	0.43 ± 0.67	1.55 ± 0.42	<0.001
BMI(kg/m^2)	16.4 ± 1.4	19.7 ± 1.2	<0.001
BMI SDS	0.0 ± 0.7	1.5 ± 0.3	<0.001
Bone age(year)	9.7 ± 0.9	9.8 ± 1.0	0.399
Tanner 3	(n=111)	(n=43)	
Age at onset (year)	7.4 ± 0.5	7.3 ± 0.5	0.590
Height SDS	1.0 ± 0.8	1.3 ± 0.8	0.045
Weight SDS	0.6 ± 0.5	1.7 ± 0.4	<0.001
BMI(kg/m^2)	17.2 ± 1.4	20.4 ± 1.9	<0.001
BMI SDS	0.3 ± 0.5	1.6 ± 0.4	<0.001
Bone age(year)	10.4 ± 0.8	10.5 ± 0.9	0.905
Tanner 4	(n=37)	(n=33)	
Age at onset (year)	7.4 ± 0.3	7.4 ± 0.4	0.574
Height SDS	1.1 ± 0.5	1.8 ± 0.8	<0.001
Weight SDS	0.7 ± 0.4	1.9 ± 0.5	<0.001
BMI(kg/m^2)	17.5 ± 1.5	21.1 ± 1.6	<0.001
BMI SDS	0.3 ± 0.5	1.6 ± 0.4	<0.001
Bone age(year)	10.8 ± 0.5	11.1 ± 0.5	0.237

RESULTS

• In Tanner 2 girls, peak stimulated LH levels were 10.9 ± 9.2 and 9.2 ± 5.6 IU/L between normal weight and obese subjects, respectively (P = 0.047).

• In Tanner 3 girls, peak stimulated LH levels were 15.5 ± 11.7 and 11.1 ± 7.5 IU/L, respectively (P = 0.026).

• However, in Tanner 4 girls, peak stimulated LH levels were not significantly different between normal, overweight, and obese subjects.

• On multivariate analysis, BMI was significantly and negatively associated with peak LH in Tanner 2 and 3 girls.

Table 2. Hormonal values of study subjects after GnRH stimulation test stratified by BMI and Tanner stage

Variable	Normal weight group	Obese group	P value
Tanner 2	(n=320)	(n=76)	
LH at start (IU/L)	1.3 (0.9-1.9)	1.4 (0.9-1.8)	0.961
Peak LH (IU/L)	7.6 (5.8-12.0)	6.9 (5.6-10.7)	0.047
FSH at start (pg/mL)	2.4 (1.8-3.1)	2.0 (1.4-3.1)	0.244
Peak FSH (IU/L)	13.8 (11.0-17.5)	13.8 (10.9-17.4)	0.239
E2 at start (pg/mL)	6.0 (5.0-9.0)	7.0 (5.0-9.0)	0.102
Tanner 3	(n=111)	(n=43)	
LH at start (IU/L)	1.4 (1.0-1.9)	1.4 (1.1-2.1)	0.807
Peak LH (IU/L)	11.8 (7.4-18.6)	7.5 (5.8-14.9)	0.026
FSH at start (pg/mL)	2.7 (1.9-3.5)	2.4 (1.6-3.0)	0.093
Peak FSH (IU/L)	12.9 (9.8-16.1)	11.4 (9.8-13.8)	0.164
E2 at start (pg/mL)	7.0 (5.0-12.0)	6.0 (5.0-10.0)	0.061
Tanner 4	(n=37)	(n=22)	
LH at start (IU/L)	1.9 (1.1-3.1)	1.8 (1.3-2.8)	0.801
Peak LH (IU/L)	17.8 (9.5-31.1)	14.6 (7.4-32.3)	0.999
FSH at start (pg/mL)	3.2 (2.3-4.5)	3.3 (2.4-4.2)	0.626
Peak FSH (IU/L)	13.3 (9.8-15.9)	11.1 (8.2-14.6)	0.151
E2 at start (pg/mL)	8.0 (5.0-14.7)	11.0 (5.0-17.5)	0.420

Table 3. Multivariate analysis of factors associated with peak luteinizing hormone values (n=621, r2=0.385, P<0.001)

Variables	Estimate	SE	P value
BMI SDS	-1.203	0.434	<0.001
Bone age	1.478	0.348	<0.001
Tanner stage	3.878	0.542	<0.001
Basal LH	5.293	0.418	<0.001

CONCLUSION

In girls with CPP, increased BMI affects peak stimulated LH levels during the early pubertal stage (Tanner stages 2 and 3). However, BMI was not associated with LH secretion in Tanner stage 4 girls with CPP.

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