

Introductions

Obesity is a well-known risk factor for central precocious puberty (CPP). Recently, elevated thyroid stimulating hormone (TSH) were reported in obese youth. However, few data regarding the relationship between CPP and TSH are available. The aim of this study was to evaluate thyroid function in CPP girls and the relationship between CPP and serum TSH concentration.

Subjects and Methods

1. Characteristics of Subjects

- Girls aged 6-9 years who underwent GnRH stimulation test for evaluation of precocious puberty.
- CPP group (n=554): peak LH ≥ 5 mIU/L,
Non-CPP group (n=693): peak LH < 5 mIU/L
- Height SDS, weight SDS, age, sex, body mass index.

2. Laboratory data

- free T4, TSH, LH, FSH level, IGF1, IGFBP3, Bone age
- Hyperthyrotropinemia: TSH > 5.0 mIU/L & fT4 ≥ 0.8 ng/dL

3. Statistics : SPSS version 20.0

- using independent T-test, Chi-square test, Pearson's correlation, multiple regression test .

Results

Table 1. Comparison of characteristic and laboratory data between CPP and Non-CPP groups

Variables	CPP (n=554)	Non-CPP (n=693)	P-value
Chronological age, CA (year)	8.11 \pm 0.49	8.12 \pm 0.57	0.828
Height (cm)	129.7 \pm 5.7	129.6 \pm 5.8	0.853
Height SDS	0.69 \pm 0.87	0.68 \pm 0.91	0.821
Weight (kg)	29.8 \pm 5.6	30.7 \pm 6.2	0.009
Weight SDS	0.64 \pm 0.87	0.76 \pm 0.93	0.018
BMI (kg/m ²)	17.6 \pm 2.4	18.1 \pm 2.7	<0.001
BMI SDS	0.43 \pm 0.96	0.62 \pm 1.02	0.001
Bone Age, BA (year)	10.28 \pm 0.54	9.07 \pm 0.77	<0.001
BA-CA (year)	2.17 \pm 0.54	0.95 \pm 0.68	<0.001
Alkaline phosphatase (IU/L)	258.9 \pm 59.7	235.4 \pm 57.8	<0.001
IGF-I (ng/mL)	303.02 \pm 104.17	258.01 \pm 85.35	<0.001
IGF-I SDS	0.78 \pm 1.19	0.26 \pm 1.00	<0.001
Basal LH (IU/L)	0.29 \pm 0.59	0.10 \pm 0.06	<0.001
Peak LH (IU/L)	11.46 \pm 9.07	3.20 \pm 1.43	<0.001
Basal FSH (IU/L)	2.42 \pm 1.46	1.58 \pm 0.85	<0.001
Peak FSH (IU/L)	13.94 \pm 4.67	12.09 \pm 3.70	<0.001
TSH (mIU/L)	3.19 \pm 1.55	2.58 \pm 1.34	<0.001
Free T4 (ng/dL)	1.38 \pm 0.14	1.44 \pm 0.18	<0.001
Hyperthyrotropinemia, n(%)	87 (15.7%)	62 (8.9%)	<0.001

Values are mean \pm SD

Table 2. Correlation of Characteristics and Laboratory Data with TSH level

Variables	r	P-value
Chronological age, CA (year)	0.216	<0.001
Height (cm)	0.130	<0.001
Height SDS	0.009	0.758
Weight (kg)	0.122	<0.001
Weight SDS	0.041	0.153
BMI (kg/m ²)	0.082	0.004
BMI SDS	0.049	0.085
Bone Age, BA (year)	0.245	<0.001
BA-CA (year)	0.121	<0.001
Alkaline phosphatase (IU/L)	0.102	<0.001
IGF-I (ng/mL)	0.104	<0.001
IGF-I SDS	0.083	0.003
Basal LH (IU/L)	0.086	0.002
Peak LH (IU/L)	0.138	<0.001
Basal FSH (IU/L)	0.115	<0.001
Peak FSH (IU/L)	0.030	0.285
Free T4 (ng/dL)	-0.133	<0.001

Table 3. Results of Multiple Linear Regression Analysis of Factors Associated with TSH concentration

Variables	Unstandardized coefficient β	S.E	P-value
Chronological age, CA (year)	0.574	0.087	<0.001
Height (cm)	-0.026	0.041	0.526
Weight (kg)	0.045	0.085	0.601
BMI (kg/m ²)	-0.037	0.149	0.803
IGF-I (ng/mL)	0.001	0.000	0.203
Alkaline phosphatase (IU/L)	0.001	0.001	0.053
Basal LH (IU/L)	-0.079	0.129	0.544
Peak LH (IU/L)	0.016	0.007	0.021
Basal FSH (IU/L)	0.062	0.041	0.130

Summary and Discussion

- Serum TSH concentration of CPP group was notably higher in CPP group whereas fT4 was lower than non-CPP group.
- The prevalence of hyperthyrotropinemia was higher in CPP group compared to non-CPP group (15.7 vs. 8.9%, $P < 0.001$).
- Age and peak LH as independent predictors of serum TSH concentration.
- Molecular similarity of LH, FSH, hCG and TSH: common α subunit + specific β subunits \rightarrow common proteins involving the regulation of TRH and GnRH receptors \rightarrow induce high levels of both LH and TSH.
- Limitation: No sex and age-matched healthy control group.

Conclusions

- Hyperthyrotropinemia in CPP could be associated with pubertal LH elevation.
- No association between hyperthyrotropinemia in CPP and obesity.