

ASSOCIATION BETWEEN TSH AND METABOLIC SYNDROME IN OBESE CHILDREN AND ADOLESCENTS



Chiara Guzzetti, Anastasia Ibba, Letizia Casula, Simona Casano, Sandro Loche

SSD Endocrinologia Pediatrica e Centro Screening Neonatale, Ospedale Pediatrico Microcitemico "A. Cao", AO Brotzu, Cagliari, Italy

INTRODUCTION

Hyperthyrotropinemia is common in patients with obesity and has been hypothesized that high TSH could be associated with an adverse metabolic profile. Few studies have been performed in pediatric population and the results are controversial.

OBJECTIVE

Aim of the study was to evaluate the association between TSH and metabolic syndrome (MS) in a large group of obese children and adolescents.

PATIENTS AND METHODS

1402 obese patients (Table 1) were included in this retrospective analysis. All patients were euthyroid or affected by mild isolated hyperthyrotropinemia with TSH 4.5-10 μ U/ml and normal fT4. Waist circumference (WC), systolic and diastolic blood pressure (SP and DP), fasting glycemia, insulin and lipids were measured in all subjects. MS was defined according to the IDEFICS criteria in 2-10 years patients and IDF criteria in patients \geq 10 years (Table 2). Homeostatic Model Assessment (HOMA index, glycemia(mmol/L) x insulin (mU/L)/22.5) was calculated as insulin resistance index.

Patients were subdivided into 3 groups according to their TSH level:

- **Group A:** normal-low TSH (\geq 0,5 - <2.5 μ U/ml),
- **Group B:** normal-high TSH (\geq 2,5 - <4.5 μ U/ml),
- **Group C:** mild isolated hyperthyrotropinemia (TSH: \geq 4.5 - <10 μ U/ml).

	Group A n=930	Group B n=432	Group C n=40
Male/Female	429/501	199/233	18/22
Age (ys)	9.8 (7.8-12.9)	9.5 (7.6-11.7)	9.7 (7.6-11.5)
Prepub/pub	503/427	273/159	25/15
BMI SDS	2.05 (1.87-2.3)	2.06 (1.85-2.31)	2.13 (1.89-2.3)
MS	97/930 (10.4%)	50/432 (11.6%)	10/40 (25%)
TSH (μ U/ml)	1.7 (1.31-2.07)	3.09 (2.74-3.6)	5.35 (4.72-5.9)
FT4 (ng/ml)	1.2 (1.09-1.39)	1.21 (1.1-1.4)	1.23 (1.1-1.4)

Table 1. Characteristics of the patients. Data are count (percentage) or mediane (interquartile range)

Age (ys)	Definition	Central obesity	Blood pressure	Dyslipidemia	Glucose intolerance
2 - <10	IDEFICS*	WC \geq 90° %ile	SP \geq 90° %ile and/or DP \geq 90° %ile	TG \geq 90° %ile and/or HDL \leq 10° %ile	HOMA-IR \geq 90° %ile and/or GLU \geq 90° %ile
10 - <16	IDF**	WC \geq 90° %ile	SP \geq 130 mmHg and/or DP \geq 85 mmHg	TG \geq 150 mg/dl and/or HDL <40 mg/dl	GLU \geq 100 mg/dl
16-18	IDF**	WC \geq 94 cm in M and \geq 80 cm in F	SP \geq 130 mmHg and/or DP \geq 85 mmHg	TG \geq 150 mg/dl and/or HDL <40 mg/dl in M and <50 mg/dl in F	GLU \geq 100 mg/dl

Table 2. MS definition according to IDEFICS and IDF age criteria. *At least 3 abnormal variables. TG, HDL, HOMA-IR and GLU are considered individually.

**Central obesity plus at least 2 others abnormal variables. TG and HDL are considered individually.

RESULTS

The overall prevalence of mild isolated hyperthyrotropinemia was 2.9%.

Median BMI, WC, and fT4 were similar among the 3 groups. The prevalence of MS was higher in patients with hyperthyrotropinemia versus euthyroid patients, but no difference was found between normal-low and normal-high TSH patients (Table 3). Among the components of MS (Table 4), the prevalence of abnormal SP was higher in patients with hyperthyrotropinemia versus euthyroid patients. The prevalence of patients with abnormal HOMA was higher even in normal-high versus normal-low TSH patients.

The results were similar when the 742 patients of 2-10 years were separately analysed.

	Group A	Group B	Group C	p	p A-B	p A-C	p B-C
MS	97/930 (10.4%)	50/432 (11.6%)	10/40 (25%)	0.016	0.53	0.004	0.005
MS IDEFICS (2 - <10 ys)	70/475 (14.7%)	44/248 (17.7%)	7/21 (33.3%)	0.01	0.27	0.02	0.08
MS IDF (10 - <16 ys)	19/403 (4.7%)	4/172 (2.3%)	3/19 (15.8%)	0.02	0.18	0.03	0.003
MS IDF (16-18 ys)	8/52 (15.4%)	2/13 (15.4%)	0/0		1		

Table 3. Differences in the MS prevalence among the 3 groups. Data are count and percentage.

	Group A	Group B	Group C	p	p A-B	p A-C	p B-C
WC	511/776 (65.9%)	238/346 (68.8%)	26/32 (81.3%)	0.14	0.34	0.07	0.14
SP	113/899 (12.6%)	61/415 (14.7%)	11/36 (30.6%)	0.002	0.1	0.006	0.01
DP	34/899 (3.8%)	21/415 (5.1%)	3/36 (8.3%)	0.15	0.11	0.17	0.53
Glycemia	64/926 (6.9%)	31/432 (7.2%)	4/40 (10%)	0.75	0.86	0.45	0.51
HOMA	346/926 (37.6%)	211/431 (49%)	26/40 (65%)	<0.0001	<0.0001	0.0004	0.052
HDL	166/926 (17.9%)	71/431 (16.5%)	10/40 (25%)	0.38	0.51	0.26	0.17
TG	74/925 (8%)	34/430 (7.9%)	4/40 (10%)	0.9	0.95	0.65	0.64

Table 4. Differences in the components of MS among the 3 groups. Data are count and percentage of patients with abnormal parameter.

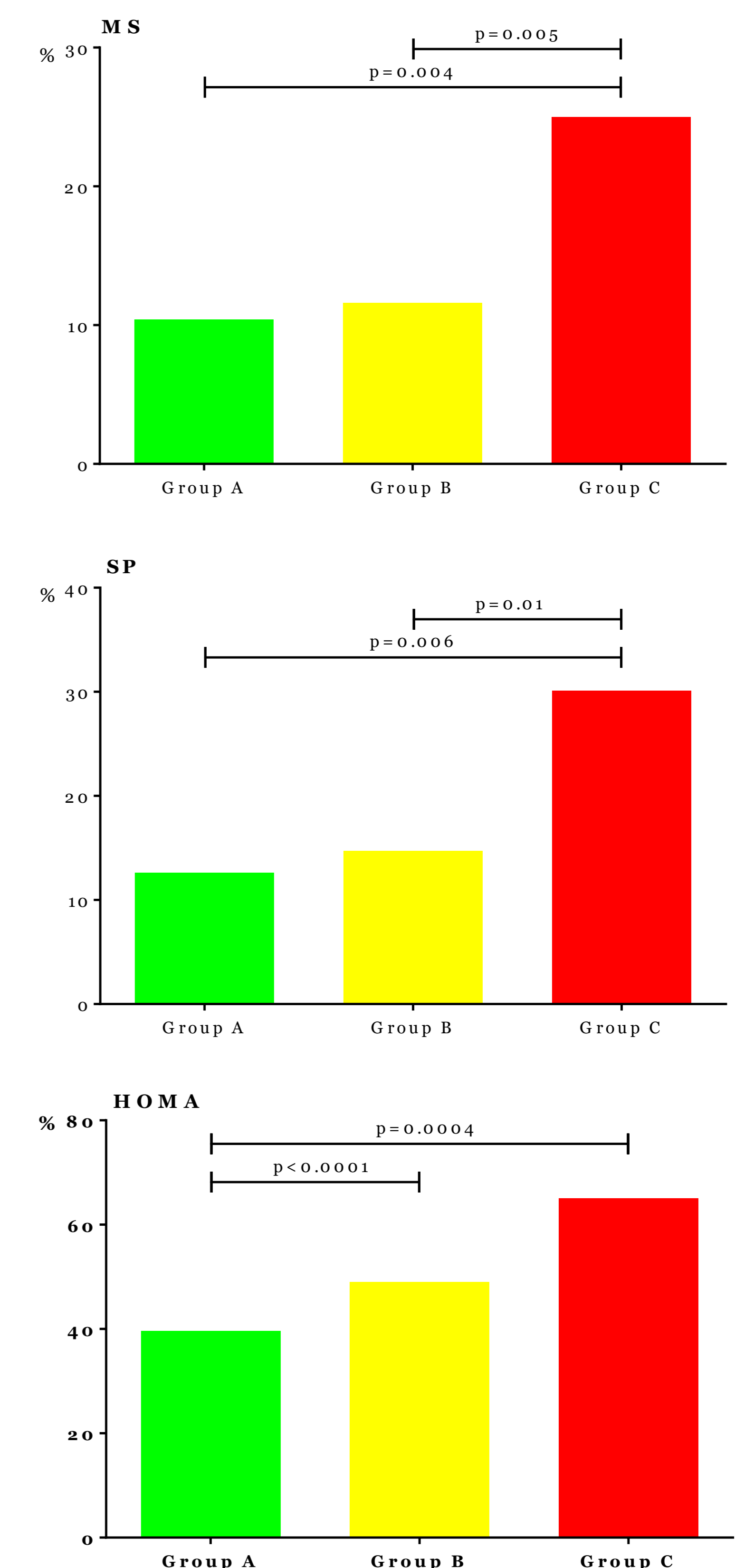


Figure. Percentage of patients with MS, abnormal SP and HOMA in the 3 groups.

CONCLUSIONS

In our large cohort of obese children and adolescents, high TSH was associated with higher prevalence of MS, regardless of their body status and fT4 levels. These results confirm the correlation between TSH and the metabolic profile, even in children <10 years. Further studies are needed to define if TSH could be involved in the pathogenesis of cardiovascular complications in obesity.

