SERUM HEPCIDIN AND FERRITIN IN PREPUBERTAL OBESE CHILDREN

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Introduction

Obesity is the direct cause of a number of immediate problems during childhood. Recently, fat mass was described as a significant negative predictor of serum iron. Hepcidin is a hormone stimulated by an increase in plasma iron levels and iron deposits in tissues, and decreases iron release from macrophages and duodenal enterocytes into the plasma. This protein prevents excessive iron absorption and iron accumulation in tissues. Ferritin is the most commonly deployed indicator for determining iron deficiency. Several studied showed an association between obesity and iron deficiency in children, but the pathophysiological mechanisms linking these nutritional disorders are not well understood.

The aim of this study was to investigate serum hepcidin, ferritin and iron concentrations in the obese and non-obese children during prepubertal period.

Methods

We determined serum concentrations of hepcidin, ferritin, and iron in 30 obese children (z-score BMI≥2SD) aged 5-10 years. Exclusion criteria were: (a) presence of endocrine disorders or genetic syndromes, including syndromic obesity; (b) other chronic medical conditions; (c) intake of medications that could affect growth, pubertal development, nutritional or dietary status; (d) patients who did not sign the informed consent. The control group consisted of 30 non-obese children (z-score BMI <-1+1>). We assessed the average daily energy intake and the percentage of energy intake from protein, fat and carbohydrates in the diets of obese and non-obese children. Average daily food rations and their nutritional value were calculated using nutritional analysis software (Dieta 5®).

Results

Serum hepcidin concentration was higher by about 40% in the obese than non-obese children ($p<0.05$) (Table1). Similar values of ferritin and iron in both of studied groups were found. The ferritin/hepcidin ($p<0.05$) ratio was almost 2-fold lower in the obese children than controls.. The daily energy intake in these children were higher ($p<0.001$) compared with the controls, but proportions of proteins, carbohydrates and fats in daily energy intake were similar in both groups (Table 2). The diet of the obese children had higher intake of iron ($p<0.01$) and vitamin C ($p<0.001$) than the diet of normal-weight children. In the obese children, hepcidin concentrations correlated negatively with BMI values ($p<0.05$), and positively with ferritin concentrations ($p<0.01$).

Table 1

Clinical and biochemical characteristics and dietary intake in the obese and non-obese children

	Children with obesity n = 30	Non-obese children n = 30	p value
Age (years)	7.5 (6.5 – 8.2)	6.8 (5.7 – 8.6)	0.082
Male (%)	51.0	56.5	0.653
Height (cm)	133.7 (122.9 – 138.0)	117.0 (111 – 124.8)	<0.001
Weight (kg)	41.3 (36.0 – 50.4)	18.1 (17.4 – 21.0)	<0.001
BMI (kg/m^2)	23.5 (21.4 – 25.2)	14.9 (14.1 – 16.1)	<0.001
BMI Z-score	3.13 ± 1.1	-0.50 ± 0.44	<0.001
Leptin (ng/mL)	9.85 (6.97 – 17.5)	1.51 (1.17 – 2.79)	<0.001
Hepcidin (ng/mL)	15.5 (8.7 – 20.3)	11.0 (6.8 – 13.5)	0.019
Ferritin (ng/mL)	29.0 (20.0 – 42.0)	25.1 (20.0 – 40.4)	0.431
Ferritin/Hepcidin	2.05 (1.44 – 2.76)	3.52 (1.76 – 5.33)	0.022
Iron (µmol/L)	13.1 (10.7 – 19.7)	15.3 (11.8 – 17.3)	0.354

Results are presented as means ± standard deviations for normally distributed data or medians and interquartile ranges (25th-75th percentiles) for non-normally distributed variables

Table 2

Clinical and biochemical characteristics and dietary intake in the obese and non-obese children

	Children with obesity n = 30	Normal-weight children n = 30	p value	Recommended daily intake
Energy (kcal/24h)	1732 (1559 – 1913)	1411 (1244 – 1460)	<0.001	4-6 years, 1400; 7-9 years, 1800-2100
Proteins (% of energy intake)	14.4 ± 2.3	13.7 ± 1.7	0.147	4-18 years, 10-20
Carbohydrates (% of energy intake)	53.6 ± 6.0	53.1 ± 7.5	0.201	4-18, 45-65
Fat (% of energy intake)	32.0 ± 5.8	32.0 ± 6.2	0.724	4-18, 20-35
Iron (mg/day)	9.10 (7.74 – 10.10)	7.60 (6.70 – 8.80)	0.005	4-6 years, 10; 7-9 years, 10
Vitamin C (mg/day)	85.5 ± 46.5	63.7 ± 25.0	<0.001	4-6 years, 50; 7-9 years, 50
Vitamin B_{12} (µg/day)	2.02 (1.65 – 2.76)	1.77 (1.66 – 2.00)	0.164	4-6 years, 1.2; 7-9 years, 1.8

Results are presented as means ± standard deviations for normally distributed data or medians and interquartile ranges (25th-75th percentiles) for non-normally distributed variables

Conclusions

Our preliminary study suggests that higher hepcidin concentrations may not affect the serum level of iron in prepubertal obese children with sufficient iron consumption.

Topic 9

Fat, metabolism and obesity

References

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