Association of BMI Z-score and Subclinical Hypothyroidism in Children and Adolescents

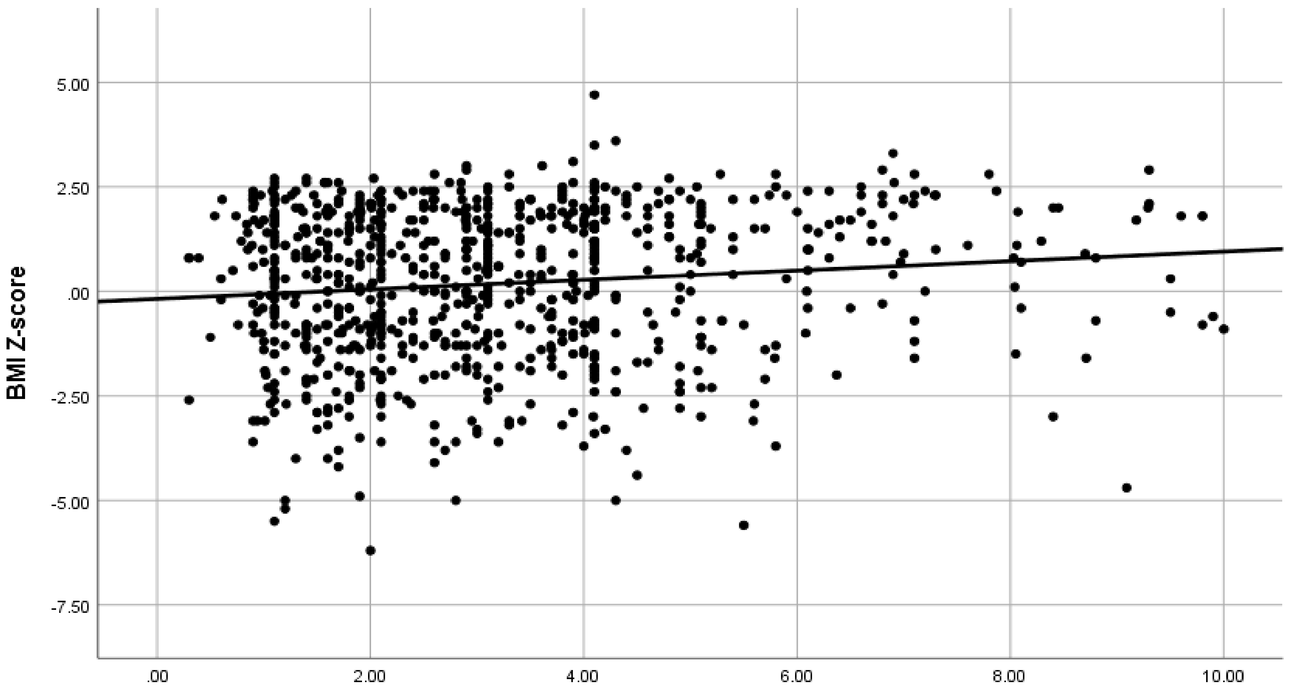
Ashkan Habib (Presenting)
Shiraz University of Medical Sciences, Shiraz, Iran, Islamic Republic of
Asadollah Habib
Kazeroon Azad University of Medical Sciences, Kazeroon, Iran, Islamic Republic of

Background

Subclinical hypothyroidism is defined as elevated TSH levels while T4 or FT4 levels are normal. Elevated TSH levels are linked with obesity in adults. In a recent meta-analysis in Iran, 6.1% of children below 18 had obesity. Due to the low number of studies on the subject in children we, designed the study to assess the relation between BMI Z-score and TSH levels in children and adolescents.

Method

This cross-sectional study was performed in a growth assessment clinic in Shiraz. Children aged between 2 to 18 years that came to the clinic for routine growth assessment follow up from January till April 2018 were considered. 850 children including 365 boys and 485 girls were included. Children with TSH between 0.3 and <10 mIU/L and normal free T4 (0.81.8 ng/dL) were included in the study. Participants with drugs or diseases affecting serum lipid or thyroid hormones were excluded. TSH levels equal or above 5 were considered abnormal. All participants with high TSH levels were considered for a second remeasurement. For these participants, second TSH levels were considered for the study.
BMI Z-score was calculated by the LMS (lambda, mu, sigma) method based on the reference of BMI distribution of CDC growth charts.



Graph 1. Distribution of subjects based on BMI Z-score and their respective TSH levels

141 participants were defined as underweight below 5th percentile (<-1.65 BMI Z-score), 369 as healthy weight between 5th and 85th percentile (-1.65 -+1.04 BMI Z-score), 116 as overweight between 85th and 95th percentile (+1.04 - +1.65 BMI Z-score) and 224 as obese above 95th percentile (>+1.65 BMI Z-score).

Results

Prevalence of subclinical hypothyroidism is increased in higher BMI groups. 9.9%, 13.8%, 17.2% and 20.5% of underweight, healthy weight, overweight and obese had subclinical hypothyroidism respectively. Obese and overweight participants had higher odds of subclinical hypothyroidism than those who were not (OR: 1.649, P=0.010, CI95% 1.126 - 2.413). On the other hand, Subclinical hypothyroid participants had higher odds of overweight or obesity than those who were euthyroid (OR: 1.650, P=0.010, CI95% 1.128 - 2.413). When TSH is set as a dependent value, TSH level is increased (P=0.126, r=0.125, P=0.001) with an increase in BMI Z-score. When BMI Z-score is set as a dependent value, BMI Z-score is increased (P=0.113, r=0.243, P=0.001) with an increase in TSH level.

Conclusion

BMI Z-score and Subclinical hypothyroidism are positively correlated however studies should be performed on establishing the causality.

Table 1. Anthropometric and laboratory values of subjects in different BMI categories

	Underweight (141)	Healthy weight (369)	Overweight (116)	Obese (224)	P
Age	8.80 ± 3.476	9.57 ± 3.560	11.03 ± 3.298	10.38 ± 2.940	<0.001
Height	123.78 ± 19.032	131.08 ± 20.632	142.44 ± 16.399	142.72 ± 15.010	<0.001
Weight	20.97 ± 7.667	30.54 ± 12.995	46.54 ± 15.833	57.72 ± 19.903	<0.001
Male (%)	56.0%	36.0%	36.2%	49.6%	<0.001
BMI	13.23 ± 1.071	16.84 ± 2.468	22.12 ± 2.910	27.49 ± 5.208	<0.001
BMI Z-score	-2.855 ± 1.1323	-0.249 ± 0.7809	1.359 ± 0.1822	2.179 ± 0.3903	<0.001
TSH	2.885 ± 1.6396	3.054 ± 1.8542	3.223 ± 1.7714	3.530 ± 2.1264	0.005