Association between adiposity measures and metabolic variables in children and adolescents with obesity

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BACKGROUND

Childhood obesity has become a major health issue in the last decades. Debate is still open about the best tool for disease diagnosis and prognosis. Waist-to-height ratio (WHR) has been associated with the risk of metabolic derangement in children and adolescents with overweight and obesity. In addition, recently, the tri-ponderal mass index (TMI) has been proposed as a better predictor of total adiposity compared to body mass index in children and adolescents.

MATERIALS AND METHODS

We investigated the association between TMI, BMI-ZS, and WHR and glucose and lipid homeostasis parameters in 1397 children and adolescents with overweight and obesity. With this aim, we performed three models of linear regression analyses: 1. simple linear regression, 2. multiple linear regression adjusting for age, sex and Tanner stage, 3. multiple linear regression adjusting for the three anthropometric measures, age, sex, and Tanner stage.

Association between anthropometric measures and metabolic variables

Variables	WHR				TMI				BMI-ZS			
	Model 1		Model 2	Model 3	Model 1		Model 2	Model 3	Model 1		Model 2	Model 3
	R^2	P	ADJ-P^1	ADJ-P^2	R^2	P	ADJ-P^1	ADJ-P^2	R^2	P	ADJ-P^1	ADJ-P^2
Fasting Insulin µU/mL (	0.07	**<0.0001**	**<0.0001**	**<0.0001**	0.02	**<0.0001**	**<0.0001**	**<0.0001**	0.04	**<0.0001**	**<0.0001**	0.27
HOMA-IR	0.06	**<0.0001**	**<0.0001**	**<0.0001**	0.01	**0.0002**	**<0.0001**	**<0.0001**	0.03	**<0.0001**	**<0.0001**	0.18
WBISI	0.08	**<0.0001**	**<0.0001**	**<0.0001**	0.02	**<0.0001**	**<0.0001**	**<0.0001**	0.03	**<0.0001**	**0.0002**	0.70
2h-Glucose mg/dL	0.003	**0.03**	**0.04**	0.10	0.0009	0.28			0.0003	0.57		
IGI	0.03	**<0.0001**	**<0.0001**	**<0.0001**	0.004	0.03	**0.004**	**<0.0001**	0.01	**<0.0001**	**0.002**	0.31
DI	0.007	**0.004**	**0.002**	**0.0009**	0.002	0.02	0.16	0.25	0.00003	0.86		
Triglycerides mg/dL	0.01	**<0.0001**	**<0.0001**	**<0.0001**	0.0008	0.30			0.004	**0.02**	0.08	
HDL mg/dL	0.03	**<0.0001**	**<0.0001**	**<0.0001**	0.01	<0.0001	**<0.0001**	0.12	0.02	**<0.0001**	**<0.0001**	0.59
TG/HDL	0.02	**<0.0001**	**<0.0001**	**<0.0001**	0.005	0.009	**0.002**	**0.0002**	0.01	**0.0001**	**0.01**	0.45
SBP mmHg	0.03	**<0.0001**	**<0.0001**	0.19	0.02	<0.0001	**<0.0001**	**0.04**	0.09	**<0.0001**	**<0.0001**	**0.01**
DBP mmHg	0.004	**0.03**	**0.0004**	0.61	0.007	0.005	**<0.0001**	0.52	0.03	**<0.0001**	**0.006**	0.30

RESULTS

At model 1, WHR, TMI, and BMI-ZS were significantly associated with the main metabolic variables. At models 2 and 3, WHR remained a significant predictor for all the metabolic parameters except for SBP, DBP, and 2h-Glucose. At model 3, TMI was significantly associated with HOMA, WBISI, IGI, HDL, triglycerides, and TG/HDL ratio, and BMI-ZS was not more a significant predictor of metabolic variables except for SBP (Table). However, TMI explained a lower variance of the three models compared to WHR for all the metabolic outcomes.

CONCLUSIONS

We found that, overall, waist-to-height ratio was the best predictor for glucose and lipid metabolism parameters followed by tri-ponderal mass index and then body mass index-Z score. Therefore, waist-to-height ratio might constitute a more valid screening tool for the clinician.

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