Body Mass Index and Body Composition with Deuterium in Costa Rican Children

Quintana-Guzmán, Eugenia and Salas-Chaves, María del Pilar
Facultad de Microbiología, Universidad de Costa Rica
San José-Costa Rica

Introduction

Obesity is a public health problem. The World Health Organization estimates that at least 300 million people worldwide are obese and 700 million are overweight. The body mass index (BMI) has been adopted as an international standard to measure adiposity. It varies with age, sex and sexual maturation with no differentiation between fat mass and mass free of grease. The analysis of body composition allows knowing if the overweight is due to fatty tissue. It has the advantage of being a method more accurately diagnosed, mainly in childhood in which large changes of water, fat and skeletal muscle components are presented. The deuterium isotope dilution method is a validated reference method for body composition analysis using Infrared Spectrometry Transformed of Fourier (FTIR).

Methods

We studied a total 118 boys and girls from 6 to 9 years old from two public schools in San José, Costa Rica. Girls and boys were weighed and measured and saliva samples were collected to determine body composition. BMI of each child was calculated by dividing weight by height squared. Then using the curves and the reference values of WHO, z score values of BMI for age were calculated and children were classified as obese if they had a value greater than +2 z, overweight between +1 and + 2 and from -2 to +1 normal and lower deficit of -2.9. Body composition by the method of deuterium dilution is considered a reference method of two compartments. Total body water is determined to estimate the fat-free mass ratios using hydration. The fat mass is calculated by subtracting the body weight to fat-free mass. This deuterium isotope technique is validated against more complex methods to determine body composition. Deuterium is a non radioactive material and it is completely harmless to health.

Results: It can be seen that the average age of the population is between 6.8 years and 8 years and the average range for age z score corresponds to a nutritional status ranging from normal to overweight. It also shows that girls are having a 57% of fat higher than males which was statistically significant difference.

Characteristics of the study population by sex and origin

	Roosevelt School		Santiago del Monte School	
	Girls	Boys	Girls	Boys
	X ± D.S.	X ± D.S.	X ± D.S.	X ± D.S.
Age (years)	7,2 ± 0,3	7,3 ± 0,2	7,3 ± 0,5	7,5 ± 0,5
Weight (Kg)	25,0 ± 5,3	25,0 ± 4,1	22,0 ± 2,7	24,1 ±4,2
Height (cm)	121,0 ± 4,8	122,8 ± 4,8	118,2 ± 5,1	119,8 ±4,9
BMI (kg/m^2)	17,0 ± 2,7	16,5 ± 1,9	15,7 ± 1,3	16,8 ± 2,2
BMI/Age (Z-score)	0,60 ± 1,24	0,39 ± 1,01	0,07 ± 0,76	0,59 ±1,16
% Fat	29,8 ± 9,9	23,1 ± 9,6	27,2 ± 7,1	23,0 ±11,7
Sample size	32	27	26	33

Discussion:

Isotopic deuterium dilution method demonstrated in this study to be more suitable for the analysis of obesity and overweight in children since BMI presented false positive and false negative results giving less accurate information of adiposity of the subject. For this reason, the isotopic dilution method with deuterium can provide a more timely treatment and improve the quality of life of individuals with obesity or overweight prevent future health complications.