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Importance of Macromineral Ratios and Products in Association with Vitamin D in Pediatric Obesity Including Metabolic Syndrome

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Abstract : Metabolisms of macrominerals, those of calcium, phosphorus and magnesium, are closely associated with the metabolism of vitamin D. Particularly magnesium, the second most abundant intracellular cation, is related to biochemical and metabolic processes in the body, such as those of carbohydrates, proteins and lipids. The status of each mineral was investigated in obesity to some extent. Their products and ratios may possibly give much more detailed information about the matter. The aim of this study is to investigate possible relations between each macromineral and some obesity-related parameters. This study was performed on 235 children, whose ages were between 06-18 years. Aside from anthropometric measurements, hematological analyses were performed. TANITA body composition monitor using bioelectrical impedance analysis technology was used to establish some obesity-related parameters including basal metabolic rate (BMR), total fat, mineral and muscle masses. World Health Organization body mass index (BMI) percentiles for age and sex were used to constitute the groups. The values above 99th percentile were defined as morbid obesity. Those between 95th and 99th percentiles were included into the obese group. The overweight group comprised of children whose percentiles were between 95 and 85. Children between the 85th and 15th percentiles were defined as normal. Metabolic syndrome (MetS) components (waist circumference, fasting blood glucose, triacylglycerol, high density lipoprotein cholesterol, systolic pressure, diastolic pressure) were determined. High performance liquid chromatography was used to determine Vitamin D status by measuring 25-hydroxy cholecalciferol (25-hydroxy vitamin D₃, 25(OH)D). Vitamin D values above 30.0 ng/ml were accepted as sufficient. SPSS statistical package program was used for the evaluation of data. The statistical significance degree was accepted as p < 0.05. The important points were the correlations found between vitamin D and magnesium as well as phosphorus (p < 0.05) that existed in the group with normal BMI values. These correlations were lost in the other groups. The ratio of phosphorus to magnesium was even much more highly correlated with vitamin D (p < 0.001). The negative correlation between magnesium and total fat mass (p < 0.01) was confined to the MetS group showing the inverse relationship between magnesium levels and obesity degree. In this group, calcium*magnesium product exhibited the highest correlation with total fat mass (p < 0.001) among all groups. Only in the MetS group was a negative correlation found between BMR and calcium*magnesium product (p < 0.05). In conclusion, magnesium is located at the center of attraction concerning its relationships with vitamin D, fat mass and MetS. The ratios and products derived from macrominerals including magnesium have pointed out stronger associations other than each element alone. Final considerations have shown that unique correlations of magnesium as well as calcium*magnesium product with total fat mass have drawn attention particularly in the MetS group, possibly due to the derangements in some basic elements of carbohydrate as well as lipid metabolism.

Keywords : macrominerals, metabolic syndrome, pediatric obesity, vitamin D
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