Obesity and dyslipidemia – An urgent matter in youth from the general population and in type 1 diabetic patients

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The prevalence of obesity among children and adolescents has significantly risen in the past decades. An analysis from the Centers for Disease Control and Prevention (CDC) reported that 16.5% of children and teenagers are overweight (body mass index or BMI in the 85th-94th percentiles) and 21.4% are obese (BMI at or above the 95th percentile) (1). Obesity in childhood has been associated with comorbidities such as hypertension, dyslipidemia and type 2 diabetes. Shashaj and cols. identified that a significant proportion of children has cardiometabolic risk factors at the onset of overweight or obesity (2). Therefore, it is important to detect overweight as soon possible in children, in order to prevent its consequences. Criteria to identify the presence of excess weight in children have to be studied and improved to enable prompt diagnosis. The current CDC charts have been elaborated in 2000 and are widely used to classify children and adolescents according to their BMI percentile. In 2007, however, the WHO suggested that these charts should be reviewed and that new cutoffs for obesity and overweight would have to be established.

In this issue of *Archives of Endocrinology and Metabolism*, Kuba and cols. (3) compared the CDC and WHO BMI z scores (4,5) for screening of overweight and cardiometabolic risk in 175 subjects between 6 and 10 years of age. The 2000 CDC and 2007 WHO reference values were concordant in classifying 161 children (92%). However, the reference values showed a discrepancy in the classification in 14 children (8%). Eleven children would be rated as overweight by the CDC and as obese by the WHO. These children were more prone to have higher blood pressure and HOMA-IR than children classified as overweight in the two classifications. Therefore, the authors suggest that the 2007 WHO reference was more sensitive in screening for overweight and obesity and their cardiometabolic associated conditions in this population. Other authors have studied the discrepancies between the two criteria. In general, the WHO has been reported to be more sensitive in pre-pubertal young children (6,7). In older children and teenagers the differences tend to disappear in different populations (8,9). Exceptions to this rule have been identified. In a retrospective cohort study with 140.265 school age students in Chile, CDC tended to overestimate the normal and underestimate the overweight, while obesity was not significant differences (10). Therefore it is possible that different criteria should be suitable for different populations, considering their predominant body composition, ethnicity and also their age.

The prevalence of obesity and dyslipidemia has been a concern not only in children and adolescents from the general population but also specifically in individuals with type 1 diabetes (T1D). The development of insulin analogs as well as the improvement in the knowledge about carbohydrate counting and insulin therapy has lead patients with T1D to be nearly as prone to obesity as the normal population when

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excessive calories are ingested, as long as they have reasonable glycemic control. Recent data show that the prevalence of overweight/obesity in children and adolescents with type 1 diabetes in USA is 31% (11). A similar trend was observed in the Brazilian population according to the Brazilian Type 1 Diabetes Study Group (Brazdiab T1DSG) (12), which is a multicenter study that evaluated the care and the clinical condition of patients with T1D in the whole Brazilian population sponsored by the Brazilian Diabetes Association. Obesity might interfere in the development of chronic micro and macrovascular complications in patients with type 1 diabetes (13,14). In another paper featured in this issue of *Archives of Endocrinology and Metabolism*, Homma and cols. found that 15.1% of children with T1D are overweight or obese (15), which is lower than previously reported nationwide in the BrazDiab (16). They also verified that dyslipidemia is common in this population, reaching 72.5% of their study group. Overweight and obesity were associated with dyslipidemia and total hypercholesterolemia was the most common abnormality. This proportion was higher than that found in other studies (16-18), even in our population (16). It is probable that the higher rates of dyslipidemia in this study are explained by the higher HbA1c levels presented by this sample, although information about TSH levels and proportion of statin users are lacking in the paper and would be important to interpret these data. Guy and cols. identified that young patients with T1D and optimal HbA1c had lipid concentrations that were similar (total cholesterol, LDL cholesterol, and LDL size) or less atherogenic (HDL cholesterol, non-HDL cholesterol, triglyceride, and triglyceride-to--HDL cholesterol ratio) than that observed in nondiabetic individuals with a similar age. However, in those with poor glycemic control, dyslipidemia was more common and a pro-atherogenic profile predominated (19). It has been discussed if glycemic control can influence the risk of macrovascular disease in patients with T1D. Data from the DCCT/EDIC suggests that intensive diabetes therapy reduces the risk of cardiovascular disease in patients with T1D (20). This might be partially explained by the differences in the lipid levels and lipid profiles in those with HbA1c within the target levels and others. Curiously, our group has previously identified that appropriate glycemic control is frequently associated with particularly low triglyceride levels (< 50 mg/dL) in patients with T1D (21), although it is yet to be determined whether this characteristic contributes to the achievement of a good glycemic control, is caused by the same favorable factors or is a feature of patients with T1D that are not under the influence of the adverse effect of poor glycemic control in their lipid levels. Low triglyceride levels have been linked to the development of autoimmunity in general (22) and it is therefore possible that they have a potential role in T1D pathogenesis, which would be evident only in those with normal glycemic control.

Homma and cols. also found that dyslipidemia was more common in adolescents than younger children (15), what would be expected based on previous studies (17,18). Females were particularly affected. As the authors did not find any association between dyslipidemia and metabolic control in females, they suggest that female gender can be, itself, a risk factor for dyslipidemia in young patients with T1D. The loss of gender protection effect for atherosclerosis diseases in women has been recognized in people with diabetes (23). However, most patients in this study had poor glycemic control and mean HbA1c levels were particularly high in adolescents. Pérez and cols. identified that adult women with T1D, but not men, had higher total and LDL cholesterol concentrations than non-diabetics when glycemic control was inadequate. In those with a good glycemic control the prevalence of dyslipidemia did not differ from that observed in nondiabetic women. Interestingly, hypercholesterolemia was less frequent in diabetic men that have good glycemic control than in nondiabetic men. The inclusion of a larger number of patients with HbA1c levels within the recommended target would be important in the paper by Homma and cols. to clarify if female gender itself, independently of the level of glycemic control, would adversely affect the lipid levels in adolescents with T1D (24).

To conclude, obesity and overweight are a major concern in children and adolescents in general population and might have serious consequences through the increase in the cardiometabolic risk factors. T1D treatment has significantly improved in the last decades. Although metabolic control is not ideal in the majority of patients with T1D worldwide (12,25), an evident catabolic state is not generally observed anymore. Therefore, this population is nearly as prone to develop overweight and obesity as the general population, which might influence their risk of hypertension, dyslipidemia, micro and macrovascular chronic complications. The burden might be especially prominent in females. Therefore, strategies to reduce body weight through healthy diet and exercise should be emphasized in patients with T1D, who are particularly at risk of developing adverse consequences of overweight or obesity and an unhealthy lifestyle.

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