Prevalence of Obesity, Diabetes and Factors Associated Among Mascarien Primary School Children (West Algeria)

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ABSTRACT

Obesity is defined by WHO as "an excess of fat mass which causes adverse health consequences." A worring increase in obesity in recent decades has been shown by several recent studies in many countries. The children who are preschool's age and young children aren't spared. This study was performed in schools during the year (2010-2011), with 2149 students aged from 9-14 years old in 5th class of primary public school of Mascara city (Algeria). We estimated the prevalence of, and identify associated factors with obesity and diabetes . For all children, the prevalence of overweight (including obesity) is 6.7%. The overweight is (5.53%) and obesity is (1.16%). The estimation revealed that girls more obese than boys (1.72% *vs* 0.63%).The diabetes type I is (0.88%) in the students, this pathology was found in (0.96%) of girls and (0.81%) boys. The consumption of sweets and nibbling between meals is frequent in plus of half obese's children. More than one children in five (39%) did not take breakfast, (46%) reported having eaten sandwiches in fast food. They have also an important sedentary behavior. So early prevention of Obesity in primary schools is necessary.
KEYWORDS: Children, diabetes, Factors, Obesity, Overweight, Prevalence.

INTRODUCTION

Childhood obesity is associated with severe health complications, both in the short and long term. It represents a predictor of cardiovascular risk in adulthood [1] and is responsible for the onset of chronic disease at an unusually early age. Obese adolescents are more likely to have prediabetes, a condition in which blood glucose levels indicate a high risk for development of diabetes[2,3] This phenomenon nonexistent ago 30 years, is taking on alarming proportions in terms of public health [4] . The aim of the present study was to determine the prevalence of, and identify associated factors with overweight , obesity and diabetes in children aged (9–14 years) educated in 5th grade in public primary schools in Mascara City during (2010 to 2011).

SUBJECTS AND METHODS

The study was carried out in fifty eight public primary schools of Mascara City during (2010 to 2011) in a sample of 9–14year-old children scolarised in 5th grade. The survey was realized during annual medical health examination. The parents of children have been informed beforehand by their teachers. For each child: anthropometric measurements (weight, height) and Serum glucose were measured. Factors associated and other data were collected by questionnaires from the answers given by the students: sex, age, siblings, address, socio-professional category of parents, habits and eating behavior, sedentary and physical activity, family history of obesity , Seniority and hereditary predisposition to diabetes. Anthropometric measurements, serum glucose and all data were collected by school doctors and nurses. Informed consent was obtained from parents of children participated in the study.

Anthropometric and biologic measurements

The weight status of children was defined from anthropometric data (weight and height). The following measurements were performed: body Weight (kg), Height (cm), Body mass index (BMI) (kg/m^2). Height was measured using a height measuring rod SECA (France; precision in cm). Body weight was measured using an electronic scale (TERRAILLON, France; 100g precision). Each child was weighed and measured standing barefoot and wearing light clothes. BMI, corresponding to the person's weight divided by the square of the person's height (kg/m^2), Body mass index (BMI) was calculated for each child. Weight status (normal, overweight or obesity) was classified using the cut-offs of the International Obesity Taskforce (IOTF 2000) [5].

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Serum glucose was measured in fasting with a Glucose meter (ACON Laboratories, San Diego, USA). Children who have high serum glucose (levels ≥1.2 g / L) they selected for analysis their fasting venous blood sample by enzymatic method. The serum was separated in aliquots and immediately frozen at -80ºC. Serum glucose were measured in duplicate and using a standard enzymatic method (Spinreact, Spain) .The diabetes was defined according to the criteria of the American diabetes Association (ADA) by a fasting glucose ≥1.2 g / L [6].

Associated factors with obesity: Habits and eating behavior, physical activity, Sedentary activity and Family history of obesity were the risk factors of obesity studied in this survey.
Habits and eating behavior was evaluate by the respect of taking meals (breakfast, morning snack, lunch, afternoon snack and dinner) during the day, the habitual consumption of food at home (in plates or sandwiches), the place of taking food (at home and / or in fast foods) (more than twice /week), the frequency of nibbling between meals (Always, Often: 1-3 times / week, Sometimes: less than once / week and never).
physical activity was evaluated by the frequency of the practice of games outside of the school day and / or day without school, the transport used for homeschooling journeys and participation in sport at school and club (in the gym).The frequency of outdoor play and practice sport participation was estimated by (Always or Often, Sometimes or never). The practice of sport at school or in the gym was expressed by (Yes / No).
Sedentary activity was assessed by time spent watching screens (TV, computer or video games) school days and day without school. The frequency was estimated by the following equivalences (More than 2 times / day equivalent to more than one hour per day, 1-2 times / day equivalent to the means of an hour a day   and never).
Family history of obesity we research the existence or not of obesity among parents.
Associated factors with diabetes were evaluated by sex, age of the child at the first diagnosis, Seniority of diabetes and Family history of diabetes.

Statistical analysis
The collected data were entered using Excel (Microsoft Office 2010) and analyzed by the software (STATISTICA 7). All results were expressed as mean ± standard deviation. An analysis of variance was applied. The prevalence of obesity and diabetes are determined by age and sex for all surveyed students. The comparisons between groups of children were assessed by the x^2 test. A *p value* <0.05 was considered significant.

RESULTS AND DISCUSSION

A total of 2207 children, 2149 (49% of girls and 51% of Boys) were included, a participation rate of 97%, had a complete data. Their age ranged between 9 and 14 years, with a mean of (10.7 ± 0.93 years), (10.61 ± 0.79 years) for girls and (10.89 ± 1.02 years) for boys. The anthropometric measurements of children are described in Table 1. High significative differences were enregisted for the age and height between boys and girls.

Table 1: Anthropometric measurements (mean ±SD) among mascarien primary school children, according to gender

	Boys (n=1108)	Girls (n=1041)	Total (n=2149)	*p*
Age (years)	10.89 ± 1.02	10.61 ± 0.79	10.7 ± 0.93	<0.001**
Weight (kg)	33.4 ± 6.80	33.09 ±7.8	33.24 ± 7.30	0.35
Height (m)	1.43 ± 0.08	1.42 ± 0.32	1.42 ± 0.08	<0.001**
Waist circumference (cm)	61.13 ± 7.31	60.59 ± 8.00	60.87 ± 7.66	0.10
BMI (kg/m²)	16.29 ± 2.22	16.60 ± 0.79	16.36 ± 2.46	0.18

BMI: Body mass index. Data was expressed using Mean ± SD. **: Statistically significant at p ≤ 0.001between boy and girl.

Prevalence of overweight and obesity
In the present study, after the calcule of BMI and according to the cut-offs of the International Obesity Taskforce (IOTF 2000), the prevalences of Overweight (including obesity) and obesity were respectively 6.7% and 1.16%. Girls are more obese than boys (1.72% *vs* 0.63%) (Fig1).
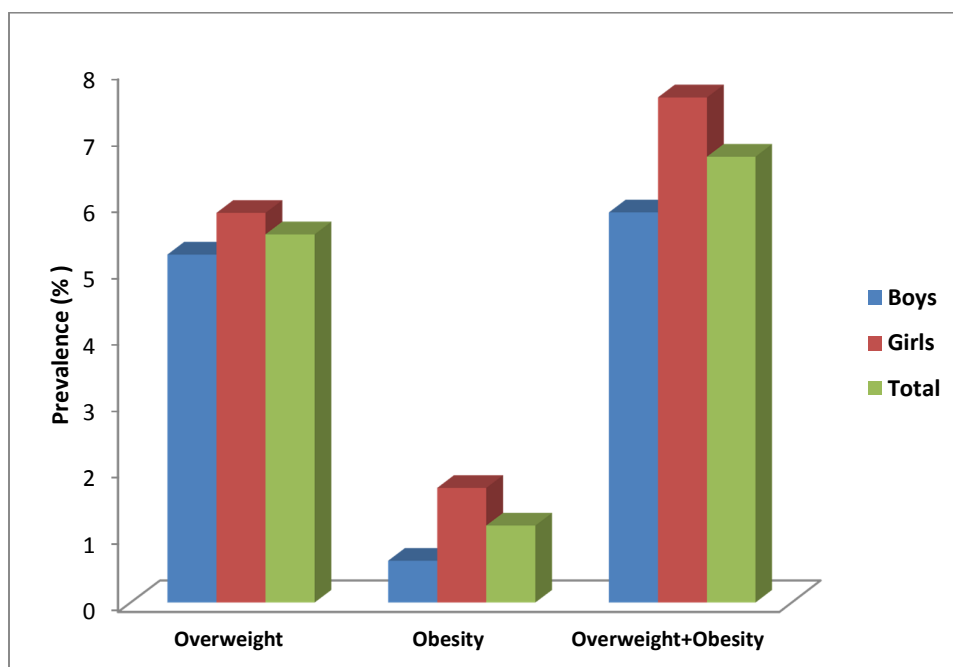
Fig 1: Prevalence of Overweight and obesity among mascarien primary school children

Overweight rates (including obesity) were highest in the age between 13–14 years for girls and 10–11 years for boys (*p=0.02*)(Fig2).
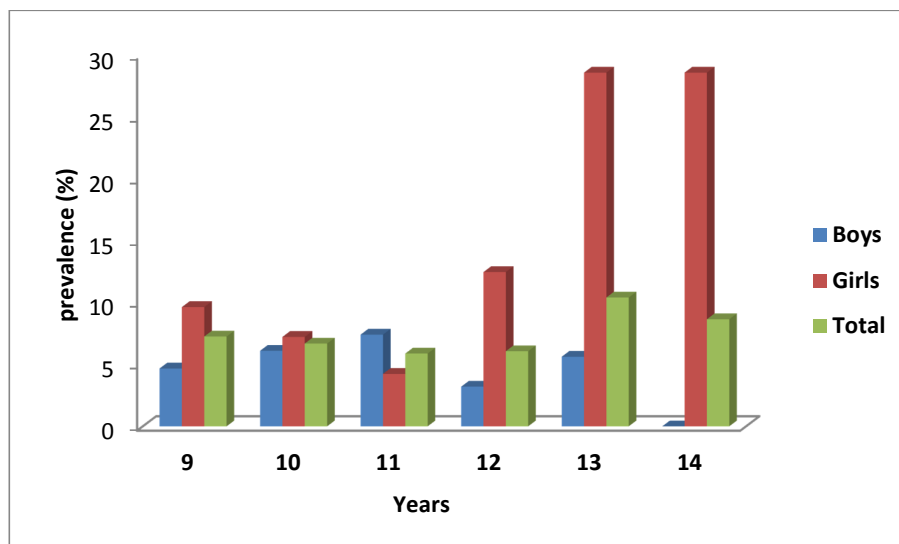

Fig2: Prevalence of Overweight (including obesity) by age and sex among mascarien primary school children

The number of children who are obese or overweight is growing at an alarming rate. In Algeria, Obesity is becoming an important public health problem affecting children . The present study and other studies conducted illustrate the progression of obesity among school children. In Constantine, in 2003, the prevalence of overweight (obesity included) in children aged 7-13 years was 2% [7]. In 2006, the frequency of overweight including obesity was 21.5% among children aged 8-12 years and 23.1% in 2009 among children aged 6-12 years [8, 9]. In Tebessa, in 2005, the overall prevalence of overweight including obesity among children 5-8 years of age was 6.36% and that of obesity was 1.41% [10].

The highest prevalence of childhood overweight are in Eastern Europe and the Middle East [11], and some Arab countries; in particular, the high-income countries and oil producers, the highest childhood obesity

prevalences were recorded in Bahrain, the UAE and Kuwait [12] .The prevalence of overweight and obesity, according to references IOTF, in children aged 11 years in 9 European countries ranged from 5.9% to 26.5%. [13]. In general, whatever the choice of the reference values used in the frequency estimate of obesity in different countries, our prevalences of overweight and obesity were lower than estimated in these countries.

Prevalence of Diabetes

Diabetes type I prevalence was 0.88%. This disease affects 0.96% girls and 0.81% boys. Diabetes prevalence peaked at age 14 years for girls (14.3%) and boys (6.3%).The mean age of children with diabetes was (10.8 ± 1.55 years). The percentage of diabetic children aged between 10 and 11 years is high (26%) than aged 9, 12 and 14 years. (Fig 3)
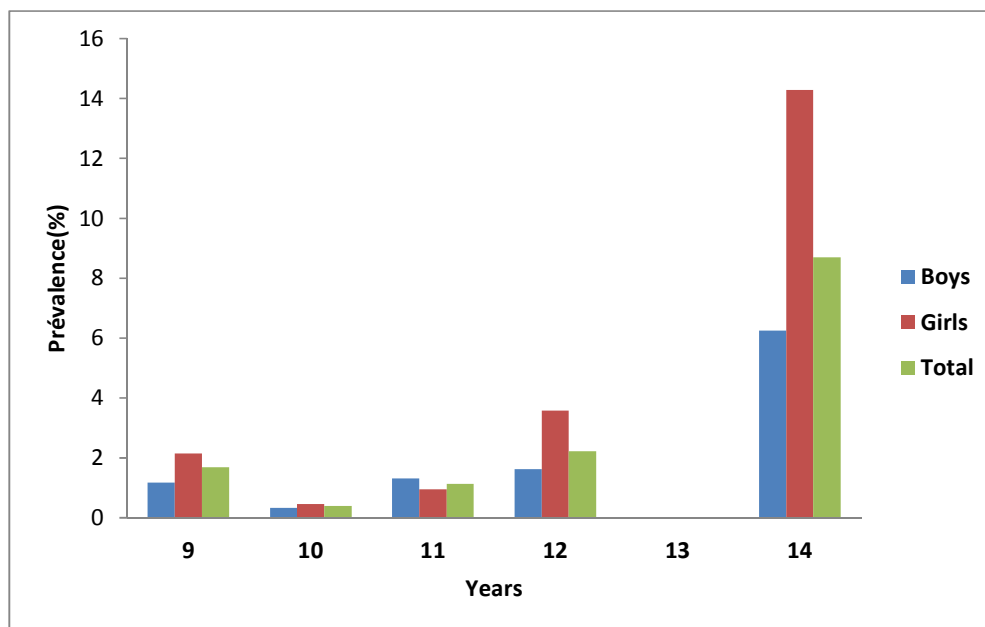

Figure 3: Prevalence of diabetes type I by age and sex among mascarien primary school children

Type 1 diabetes incidence is increasing, a consistent finding in most pediatric disease registries in the world [14,15]. In Algeria, according to the records of Constantine and Oran, the annual incidence of diabetes is around 12 cases per 100,000 children under 15 years. The prevalence of diabetes is (0.58 ‰) in Constantine and (0.44 ‰) in Oran [16].

The comparison with other studies is very delicate, given the paucity of epidemiological studies on diabetes in children in Algeria.

Factors associated with obesity

Eating habits and behavior, physical activity are presented in Table 2. A significant difference was noted in taking breakfast, absent in obese children nearly two in five (39%) against one in four (27%) in the group of children without obesity (p <0.0001). A low frequency (39%) was recorded for the morning snack while almost three-quarters of children have an afternoon snack .The association between obesity and less frequent breakfast consumption has been well shown in the work of Siega-Riz and al in children and adolescents [17].

Table 2.Factors associated with obesity among mascarien primary school children

	Children without obesity (%)	Obeses children (%)
Eating habits and behavior		
Taking meals		
breakfast	72.5	60.7
morning snack	40.1	39.3
lunch	100	100
afternoon snack	76.9	71.4
dinner	98.5	100
The habitual consumption of food at home		
plates	54.4	53.6
sandwiches	45.6	46.4
The place of taking food		
At home	67.1	53.6
In fast foods	32.9	46.4

Nibbling between meals		
Always	39.5	53.6
Often	28	32.1
Sometimes	31.9	14.3
Never	0.5	0
Physical activity		
Outdoor play practice		
School Days		
Always or Often (daily or 4-6 times / week)	23.8	21.4
Sometimes or never (1-3 times / week or never)	75.9	78.6
Days without school		
Always or Often (daily or 4-6 times / week)	73.9	60.7
Sometimes or never (1-3 times / week or never)	26	39.3
Transport used to make journeys homeschooling		
Walk	93.1	71.4
Car or bus	6.9	28.6
Sport at school		
Yes	58.5	60.7
No	41.5	39.3
Sport at gym		
Yes	38.8	42.9
No	60.8	57.1

Concerning the habitual consumption of food (46%) of obese children eat meals in fast-food against (33%) children without obesity but no statistically significant difference was observed about the preferences of meals taken in fast food ($p = 0.1$). Several studies incriminate the role of food in fast food in the increased prevalence of obesity; they found that the same BMI z-score is associated with the number of meals in fast-food [18]. More half of obese children (54%) nibbling between meals (Table1).

Concerning the physical activity, the daily practice of outdoor games is less frequent in the majority of children, only two out of ten children reported playing outside after school. Over (39%) of obese children by providing children without obesity prefer to stay in the house at the days without school .Regarding the means of transport, a little more than an obese children use a car or bus. The frequency of obese children who go walking to school is (71%) *vs* (93%) of children without obesity ($p = 0.2$). In the end, the frequency of obese children who practice a sport in the gym was (29%) more than children without obesity (23%) ($p = 0.43$). (Table1)

The frequency of use of television is one to two times per day at days without school (62%) and even days of school (84%) of all students. A statistically significant difference is observed between obese groups and without obesity concerned the use of this medium more than two times per day at days without school (39% vs. 32%, *p <0.05*) and the majority of students (54%) use a computer more than once a day at days without school (Fig 4).
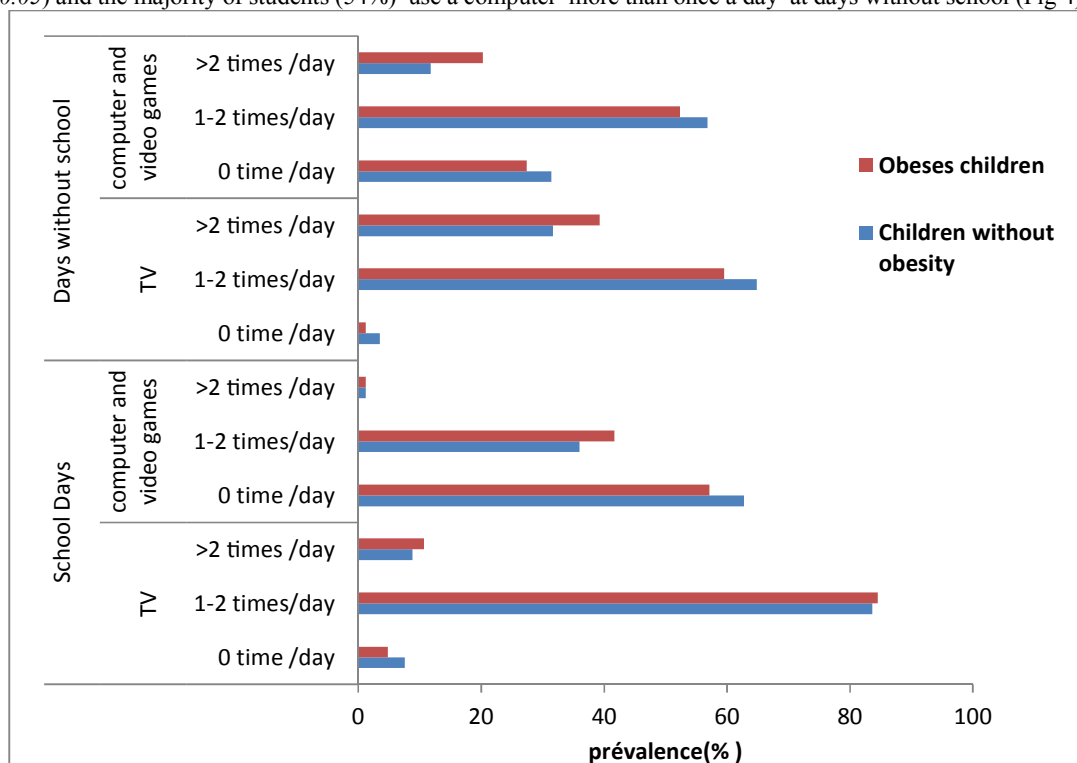

Fig 4: Prevalence of sedentary activity among mascarien primary school children

However, sedentary behavior is more important for the majority of students especially in obese children who use more the screens (TV, computer or video games). In this study, the daily frequency of the practice of outdoor games is too limited. Our results are consistent with previous studies showing the rapid increase of overweight and obesity in children in association with the increase in time spent watching television, video and computer games [19].

Moreover, an association between parental overweight and that of the child was recorded mostly on the maternal side, over 46% of obese boys 38% of obese girls have an obese mother(p <0.05) (Fig 5).
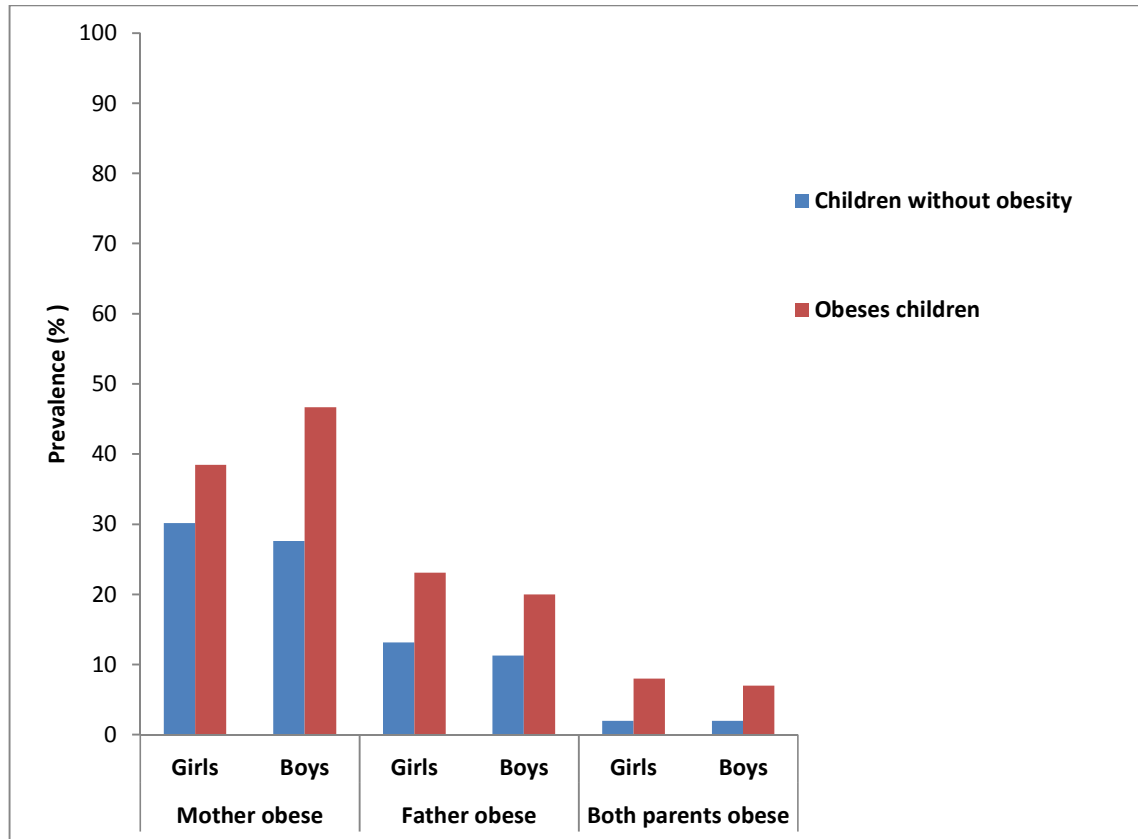

Fig 5 : Prevalence of family history of obesity among mascarien primary school children

In our study, some elements of child lifestyle, such as the composition and duration of meals, attendance at the school canteen, daily walking time and the socioeconomic level of the family (the occupational category of parents, dwelling characteristics ...) have not been taken into account as factors associated with obesity. Finally, parental body size is an important factor that must be controlled because a strong association between parental obesity and that the child has been registered in this study, especially the mother's side. The risk of overweight in children is more important in case of parental obesity, especially if both parents are affected [20].

Factors associated with diabetes

In our study, the sex ratio of children diabetic was (1.1), the mean age at the first diagnosis was $(8.7 \pm 3.1$ years), seniority diabetes by contributing to the child's age was $(2.09 \pm 2.01$ years).

Finally, (37%) of children has a family history of type 1 diabetes, the role of genetic in the development of childhood diabetes has been well demonstrated in the literature [21].

CONCLUSION

In this study, the prevalences of overweight and obesity were important in primary schools at Mascara city. This problem was associated with risk factors, rare intake of breakfast, high food taken between meals and fast food visits, high level of sedentary activity. Investigations on the prevalence and factors associated with childhood diabetes are rare and deserve to be expanded. Programs of prevention are necessary at schools an early age to avoid the formation of persistent obesity in adulthood.

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