

# Risk factors associated with diabetes in primary school students in the Amazon region of Brazil

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## Risk factors associated with diabetes in primary school students in the Amazon region of Brazil

### Abstract

**Objective.** Identifying risk factors for diabetes (diabetes plus obesity) in primary students in the Brazilian Amazon. **Methodology.** Descriptive study carried out in 2009 with the participation of 1 218 students. A questionnaire from the Ministry of Health of Brazil was employed with the question “How is your diet?” and a form was created to record the socio-demographic, clinical, anthropometric and food variables. **Results.** The mean age was 12 years and 57% were female. 64% of respondents reported no health problems, 37% had a family history of diabetes mellitus and 29% of students were overweight (17% overweight and 12% obese). A sedentary lifestyle was prevalent in the study group (70%). The dietary guidelines for consumption of fruits, vegetables, legumes, and complex carbohydrates are not properly fulfilled. Fast foods or ‘junk’ food was consumed by 43.5% of students. **Conclusion.** Most of the identified risk factors were related to unhealthy lifestyles that can lead to diabetes and other chronic non-communicable diseases. Identifying these factors allows planning nursing interventions for students, teachers and families.

**Key words:** Diabetes Mellitus; obesity; feeding; students.

## Factores de riesgo relacionados con la diabetes en estudiantes de escuelas primarias en la región Amazónica de Brasil

### Resumen

**Objetivo.** Identificar los factores de riesgo para diabetes (diabetes más obesidad) en estudiantes de primaria de la Amazonía brasileña. **Metodología.** Estudio descriptivo desarrollado en 2009 con la participación de 1 218 estudiantes. Se empleó el cuestionario “¿Cómo es su alimentación?” del Ministerio de Salud de Brasil y una ficha creada para registrar las variables sociodemográficas, clínicas, antropométricas y de alimentación. **Resultados.** La edad

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media fue de 12 años; sexo femenino, el 57%; El 64% de los encuestados no declaró problemas de salud; el 37% presentó antecedentes familiares de Diabetes Mellitus; el 29% de los estudiantes tuvo exceso de peso (17% con sobrepeso y 12% con obesidad). El sedentarismo prevaleció en el grupo estudiado (70%). La guía alimentaria para el consumo de frutas, verduras, legumbres y carbohidratos complejos no se cumplió adecuadamente. El 34.5% de los estudiantes consumía comidas rápidas o alimentos “chatarra” **Conclusión.** La mayor parte de los factores de riesgo identificados se relacionaron con estilos de vida no saludables que pueden llevar a la diabetes y otras enfermedades crónicas no transmisibles. Identificar estos factores permite planificar intervenciones de enfermería en los estudiantes, profesores y familiares.

**Palabras clave:** Diabetes Mellitus; obesidad; alimentación; estudiantes.

### Fatores de risco relacionados com a diabetes em estudantes de escolas primárias na região amazônica do Brasil

#### ■ Resumo ■

**Objetivo.** Identificar os fatores de risco para diabetes (diabetes mais obesidade) em estudantes de primária da Amazônia brasileira. **Metodologia.** Estudo descritivo desenvolvido em 2009 com a participação de 1 218 estudantes. Emprego-se o questionário “Como é sua alimentação?” do Ministério de Saúde de Brasil e uma ficha criada para registrar as variáveis, sócio-demográficas, clínicas, antropométricas e de alimentação. **Resultados.** A idade média foi de 12 anos e o 57% foram de sexo feminino. O 64% de interrogados não declararam problemas de saúde, o 37% apresentaram antecedentes familiares de Diabetes Mellitus. Tiveram excesso de importância o 29% dos estudantes (17% com sobrepeso e 12% com obesidade). O sedentarismo prevaleceu no grupo estudado (70%). A guia alimentaria para o consumo de frutas, verduras, legumes e carboidratos complexos não se cumpriu adequadamente. As comidas rápidas ou alimentos “sucata” era consumida pelo 43.5% dos estudantes. **Conclusão.** A maior parte dos fatores de risco identificados se relacionaram com estilos de vida não saudáveis que podem levar à diabetes e outras doenças crônicas não transmissíveis. Identificar estes fatores permite planificar intervenções de enfermagem nos estudantes, professores e familiares.

**Palavras chave:** Diabetes Mellitus; obesidade; alimentação; estudantes.

## Introduction

Medical science is facing an epidemiological transition determined by the reduction of communicable diseases and the rise of chronic non-communicable diseases (NCDs). This new epidemiological approach can lose one of the main achievements of the twentieth century: the considerable increase in life expectancy and quality of life of mankind.<sup>1</sup> The health sector has a key role in this scenario and needs prioritized investments based on research, surveillance, health promotion and disease prevention in defense of a healthy life. In this context, many consequences are generated by the high morbidity

and mortality rates attributed to NCDs, bringing repercussions for patients, their families and the society.

It is noteworthy that diabetes mellitus (DM) is a serious public health problem of increasing global incidence, and along with that comes its impact as a chronic health condition in the lives of individuals, their families and society as a whole.<sup>2,3</sup> This problem has made diabetes mellitus an important cause of morbidity and mortality that when associated with metabolic dysregulation, will cause secondary alterations such as kidney

failure, non-traumatic amputations of lower limbs, blindness in adults and vascular diseases.<sup>4</sup>

The disease underdiagnosis - estimated between 30% and 60% - is an aggravating factor for the prevention of its complications.<sup>5</sup> In Brazil, 12.4 million people were diagnosed with diabetes in 2011 and it is expected that this number will increase to 19.6 million people by 2030. Among the types of DM, type 2 is responsible for 90% of cases and is directly related to overweight and a sedentary lifestyle, among other factors.<sup>6</sup> In the state of Amapá, according to information from the Ministry of Health (Ministério da Saúde - MINSa) in the Diabetes and hypertension system of registration and control (SIS-HIPERDIA) which is grouped by state, between January 1999 and April 2008 it were diagnosed 764 cases of DM, with 65.7% of the female gender.<sup>7</sup>

Along with the growing problem of DM, obesity is also a concern nowadays and its impact on children and adolescents is discussed because it has reached epidemic proportions, bringing other diseases together with it. Several countries are concerned about the weight gain in these phases of life. The incidence of weight excess and obesity at these ages has been considered more common in industrialized countries for a long time, however, in recent years there have been changes in the distribution map, reaching alarming proportions worldwide.<sup>8</sup> Obese children and adolescents have potential to become obese adults and may have risk factors for the occurrence of psychosocial disorders, cardiovascular disease, hypertension, sleeping disorders, DM and dyslipidemia.<sup>9</sup> For this reason, government agencies should devote more attention to these alarming figures and seek solutions to control weight excess in children and adolescents.

In this sense, nowadays we are facing a global epidemic that is not linked to transmission agents but related to urban living conditions: stress, inactivity and poor quality of diet. This epidemic called diabetes - a contraction of the words 'diabetes' and 'obesity' - is on accelerated course in Brazil and worldwide.<sup>1</sup> The importance

of addressing this problem through identifying risk factors in populations is justified by the fact that currently there has been an increase in the number of people with unhealthy lifestyles as well as an increase in overweight and obesity, with the consequent negative impact in the number of diabetics.

Given this situation, it is worth noting the important role of nurses in health programs as trainers in continuous learning and key members of the health team, performing care duties, planning and executing programs for promotion of health and prevention of chronic non-communicable diseases, among them the diabetes. Knowing that this health problem can be prevented, nursing professionals need to aim their actions to the promotion of health and prevention of these diseases that severely affect the quality of life of those suffering from it. The guidelines should be focused on the adoption of a healthy lifestyle by individuals, their families and communities, so that they get hold of their right which is also an important resource for everyday life: their health. In order to do so, it is necessary, at first, to identify the existence of this problem locally and secondly to develop strategies that aim at solving it. Hence the following study was carried out with the objective of identifying the prevalence of clinical, anthropometric and diet risk factors for the development of diabetes in primary students of public and private schools of the city of Macapá, Amapá, Brazil.

## Methodology

A cross-sectional study was conducted in a representative sample of 1218 students aged between nine and 19 years, enrolled between the fifth and eighth grades in four elementary schools, two public and two private, in the city of Macapá, Amapá, Brazil. Data collection was carried out by researchers in the period between May and August 2009. The characterization of the study population was done directly in the selected schools with the written consent of

schools headmasters and students' parents, which allowed knowing the profile of students in terms of diabetes risk factors as well as other non-communicable diseases.

Schools were selected based on convenience but the aspects of availability, accessibility and inclusion of the different areas in the city were also taken into consideration. For calculation of the study population it was used a simple random sample in accordance with the number of school students, considering a sampling error of 5%.

Two instruments were used to collect and record data and information on risk factors and diet: a form developed by researchers to record socio-demographic variables (age, sex, education), clinical variables (health problems, family history of diabetes) and anthropometric parameters (weight, height, body mass index - BMI), and the questionnaire "How is your diet?" created by the General coordination of food policy and nutrition of the Ministry of Health of Brazil.<sup>10</sup> The collection of data on clinical risk factors and food consumption occurred through face to face interviews. The anthropometric data collection was done during physical education classes with the use of a digital height-weight scale (capacity 0-150 kg/100g). The BMI children-age classification of the World Health Organization was followed (thinness:  $<18.5 \text{ kg/m}^2$ ; normal weight:  $\geq 18.5 \text{ y } \leq 24.9 \text{ Kg/m}^2$ ; overweight:  $\geq 25.0 \text{ y } \leq 29.9 \text{ Kg/m}^2$ ; and obese:  $\geq 30.0 \text{ Kg/m}^2$ ). The BMI cut-off points established for adolescents according to the standards of the Food and nutrition monitoring system (Sistema de vigilância alimentar e nutricional – SISVAN 2004) were: low: percentile  $<3$ ; eutrofic (adequate): percentile  $\geq 3 \text{ y } <85$ ; overweight: percentile  $\geq 85 \text{ a } <96$ ; and obese, percentile  $\geq 97$ . Physical activity practice was considered as the times per week that participants reported doing it. They were classified as sedentary if practiced two or fewer times per week.

For data analysis the Statistical Package for Social Sciences (SPSS) version 17.0 was used. The study complied with Resolution 196/96 of the National

health council of Brazil and was approved by the Committee of ethics in research of the Faculdade SEAMA de Macapá under protocol nº 042/09.

## Results

Among the participants of this study - a total of 1218 students aged between nine and 19 years - the mean age was  $12.3 \pm 1.4$  years and 56.7% were females. A total of 35.6% reported having some kind of health problem, especially allergies and 37.1% of participants reported having diabetic relatives. Another 23.4% do not have this kind of medical history and the remaining 39.5% do not know it. Students classified as sedentary were 69.5% of the total.

In relation to BMI classification, 68.7% of students were at normal weight, 16.9% were overweight, another 11.6% were obese and 2.8% were underweight for their age.

Table 1 shows the distribution of students according to the eating habits variables. The data shows that only 35.2% of the students meet the recommended daily intake of three or more portions of fruit, a total of 28.6% have a sufficient intake of vegetables and leafy vegetables and 37.1% ate legumes one to four times a week. As for complex carbohydrates (rice, flour or pasta) it was found that 35.2% of students have the recommended intake of these foods and 14.9% ingested 11 or more servings daily, which may be a factor to consider for developing obesity.

In relation to protein intake it was estimated that 81.7% of students consumed two or more daily servings of meat or eggs. When asked if they removed fat when consuming beef or chicken 69.7% of respondents claimed to have this practice. As for the type of fat used in food preparation at home, half of the students reported using vegetable oil. Referring to the increase of salt in prepared foods, 77.6% of students reported not add this seasoning before tasting the food.

When questioned about the intake of sweets and saturated fat (fried food), one in three students reported to consume them daily. When asked about replacing meals with snacks, data showed that 43.5% of students do not do it. Regarding

water daily intake, results showed that over 50% of the sample ingests water quantity in accordance with standard recommendations, but 40.8% consumed soft drinks daily.

**Table 1.** Food consumption and dietary habits of 1218 students in Macapá-AP (Brazil), 2009

Food	Frequency	Number	%
Daily portions of fruit or natural juices	0	67	5.5
	1	331	27.2
	2	391	32.1
	3	246	20.2
	4	183	15.0
Number of daily tablespoons of vegetables/leafy vegetables	0	347	28.5
	1-4	523	42.9
	5-8	192	15.8
	≥9	156	12.8
Number of weekly servings of legumes	0	96	7.8
	1	231	19.0
	2	214	17.6
	3	225	18.5
	4	452	37.1
Number of daily tablespoons of rice, flour or pasta	0	56	4.6
	1-5	733	60.2
	6-10	247	20.3
	≥11	182	14.9
Number of daily servings of meat or egg	0-1	222	18.2
	2	535	44.0
	≥3	461	37.8
Removes fat from meat or chicken skin	No	320	26.3
	Yes	849	69.7
Type of fat used for food preparation	No consumption	49	4.0
	Vegetable oil	612	50.2
	Butter	120	9.9
	Margarine	90	7.4
Add salt to food before tasting	Do not know	396	32.5
	Yes	273	22.4
Number of days of intake of sweets and saturated fat (fried food) per week	No	945	77.6
	0-1	196	22.3
	2-3	346	28.4
	4-5	214	17.6
	7	386	31.7

**Table 1.** Food consumption and dietary habits of 1218 students in Macapá-AP (Brazil), 2009

Food	Frequency	Number	%
Replace meals with snacks	Always	170	14.0
	Sometimes	518	42.5
	Never	530	43.5
Daily consumption of water (glasses)	<1	21	1.7
	1-2	87	7.1
	3-4	231	19.0
	5-7	313	25.7
	≥8	566	46.5
Frequency of soft drinks consumption	Daily	497	40.8
	Weekly	381	31.3
	Monthly	53	4.4
	Rarely	244	20.0
	Never	43	3.5

## Discussion

The study carried out in schools in Macapá showed that a significant proportion of students presented unhealthy behaviors with reference to food and exercise and if there is no timely intervention it may put them at risk of diabetes and other chronic non-communicable diseases.

This study on risk factors for diabetes in children and adolescents is important because it is known that diabetes is being diagnosed with increasing frequency in this age group. The early disease onset can be prevented if risk factors can be identified and modified, especially dietary habits and physical exercise. According to Li *et al.*,<sup>11</sup> group interventions based on lifestyle changes with duration of more than six years can prevent or delay diabetes onset for up to 14 years in people with impaired glucose tolerance (IGT). The WHO believes that schools are fundamental for the development of healthy lifestyles and that conducting prevention programs from school age is essential to promote and consolidate healthy eating habits.<sup>12</sup>

Inheritance is one of the most important risk factors for DM and the percentage of students with this background among respondents was high,

but the magnitude of the problem could not be specified because a third of them could not affirm the existence of this family status. Family history of diabetes is a risk factor to consider for detecting undiagnosed diabetes risk; the probability of being diabetic is much greater when there are previous cases of the disease in the family.<sup>14</sup> A study by Naghettini *et al.*<sup>15</sup> described a history of DM in 33.1% of grandparents, 2.7% of fathers and 1.5% of mothers of schoolchildren in the studied sample. Taking that into consideration, it is very important to know about hereditary factors in order to identify candidates for receiving interventions of chronic diseases prevention.

The sedentary lifestyle prevailed in the survey and is directly linked to the lack of physical activity reported by students despite physical education (PE) being part of school curriculum. The WHO states that an active lifestyle throughout the cycle of life is a strategic priority, and recommends that children get at least 60 minutes of daily physical activity.<sup>16</sup> Although the sedentary lifestyle is a well known problem due to its serious impacts on health, such as increased risk of obesity and diabetes, the lack of a culture that promotes physical activity plus increased hours at the

television and video games, and the reduction of hours dedicated to playing outside have helped to increase this problem. Among all the participants of this research 29% were overweight (17% overweight and 12% obese) which is almost three times of what reported a similar study by Junior and Silva.<sup>17</sup>

With reference to the consumption of five daily servings of vegetables and legumes, it was minimal. Although the reasons for this eating behavior have not been defined, they could be related to difficulties in the availability, accessibility or consumption. Statistics from the Ministry of Health of Brazil on the consumption of fruits, vegetables and leafy greens showed that only 17.7% of the Brazilian population meets the recommended guidelines. An exploration about this subject would complement the results obtained in Macapá and help to delimit the problem, its causes and how to cope with it.

Consumption standards of legumes and animal protein were fulfilled by the participants of this study. The impact of animal protein consumption on human development and growth is well known. Half of the students in this study reported using vegetable oils at their homes for cooking food and a lower number reported using margarine, which contains trans-fats that increase cholesterol levels and decrease high-density lipoproteins. Texeira *et al.*<sup>18</sup> in a study on fat consumption and cholesterol with students in Niterói, found that 31% of young people had elevated serum total cholesterol above the threshold limits that had been associated with inadequate intake of fats.

There was a high percentage of students who reported consuming fast foods, sweets and fried foods, an inadequate eating behavior practiced daily by one in three respondents. Those eating behaviors associated with a sedentary lifestyle contribute to the continuous increase in the prevalence of obesity in the school population.<sup>19,20</sup> One in every five participants adds salt to food before tasting. Those improper eating habits together with fast food intake (which usually has high salt content) and a high consumption of soft

drinks add unnecessary calories and increase the risk of obesity.

The proportion of students who replace meals with snacks was concerning and in many occasions this was related to excessive consumption of junk food which leads to weight gain and therefore, the possibility of diabetes. The results of this study are similar to the ones found worldwide and reflect the current reality where there is a high consumption of soft drinks, especially by children and adolescents. In this sense, a study by Araki *et al.* on adolescent eating patterns identified the snacks consumed as substitutes for lunch: bread stuffed with cold cuts, cheese bread, hamburgers, pies, pizza, chocolates, peanuts, fruits, juices, soft drinks and yogurt.<sup>21</sup>

Any intervention in this direction should aim at increasing consumption of foods that are low fat and rich in nutrients such as cereals and wholemeal bread, fruit, vegetables and dairy products which can help to prevent excessive weight gain in this population. Hence, defending the importance of attention to these diseases in the Political Declaration of the High Level Meeting of the General Assembly on the Prevention and Control of NCDs, it was recognized the need to “encourage the development of multi-sector public policies that create equitable environments of health promotion that empower individuals, families and communities to make healthy choices and lead healthy lives; and to promote the application of all WHO recommendations on the marketing of foods and non-alcoholic beverages to children, including foods high in saturated fats, trans-fatty acids, sugars, or salt”.<sup>22</sup>

The results obtained in this study allowed us to observe that inadequate food consumption is significantly present in the study population. Since this factor is known to contribute with the incidence of NCDs, especially diabetes, it is essential to intervene as early as possible. This scenario highlights the important role of nursing in the planning of actions that can strengthen programs to promote health and prevent the risk of diabetes. These programs should be aimed at

adolescents, families and the community, and have the purpose of promoting behaviors and lifestyles as a means of prevention, also including early detection and timely treatment of NCDs, with emphasis on diabetes.

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