



## ORIGINALES

### Maternal Nutrition and Physical Activities Strategies to Prevent Type II Diabetes Mellitus in School Children

Estrategias Maternas de Alimentación y Actividad Física para prevenir la Diabetes Mellitus Tipo II en Hijos Escolares

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<http://dx.doi.org/10.6018/eglobal.16.4.256751>

Received: 17/04/2016

Accepted: 08/08/2016

#### ABSTRACT:

**Introduction:** Type 2 Diabetes Mellitus is a major public health problem, it is one of the most frequent chronic diseases and causes a decrease in quality of life, and therefore, it is necessary to know the major strategies of nutrition and physical activity for prevention since the early stages of life.

**Objective:** To know the strategies of nutrition and physical activity performed by mothers to prevent Type 2 Diabetes Mellitus in school children.

**Materials and methods** Pilot test of a descriptive study with a simple random sampling in 30 mothers with school children carried out in an elementary school located in the community of Sabinas Hidalgo, Nuevo León, Mexico. The instrument "Scale of Parental Strategies for Nutrition and Physical Activity" of 26 items was applied. Results: It was found that the highest measure was of Reinforcement with a  $\bar{x}$  of 64.00 (SE =18.84) which is aimed to praising children when they perform healthy behaviors and a lower Supervision with 51.33 (SE =20.80) defined as the degree in which parents supervise their children's healthy behaviors.

**Conclusion:** Children, when exercising healthy behaviors, mothers praise them and have a greater control over them in favor of doing the most desirable in their physical activity and if they, in contrast, perform unhealthy behaviors regarding to their nutrition will be limited, supervised and sanctioned such conducts.

**Keywords:** Strategies; Child rearing; mothers; diabetes mellitus

## RESUMEN:

**Introducción:** La Diabetes Mellitus Tipo 2 constituye un problema de salud pública importante, es una de las enfermedades crónicas más frecuentes, causa disminución de la calidad de vida, es por ello que es necesario conocer las estrategias de alimentación y actividad física para su prevención desde etapas tempranas de la vida.

**Objetivo:** Conocer las estrategias de alimentación y actividad física que realizan las madres para prevenir la Diabetes Mellitus Tipo 2 en hijos escolares.

**Materiales y métodos:** Prueba piloto de un estudio descriptivo con un muestreo aleatorio simple en 30 madres con hijos escolares realizado en una escuela primaria ubicada en el municipio de Sabinas Hidalgo Nuevo León, México. Fue aplicado el instrumento "Escala de Estrategias Parentales de Alimentación y Actividad Física" de 26 ítems.

**Resultados:** Se encontró que la media más alta fue de Reforzamiento con una  $\bar{x}$  de 64.00 (DE= 18.84) la cual está dirigida a elogiar a los hijos cuando realizan conductas saludables y más baja Monitoreo con 51.33 (DE= 20.80) que se define como el grado en el cual los padres supervisan las conductas saludables de sus hijos.

**Conclusión:** Los niños al ejercer conductas saludables, las madres elogian y tienen un mayor control sobre ellos en favor de que realicen lo mayormente deseable en su actividad física y si estos, al contrario realizan conductas no saludables respecto a su alimentación se les limita, supervisa y sancionan tales conductas.

**Palabras clave:** Estrategias; crianza del niño; madres; diabetes mellitus.

## INTRODUCTION

Type 2 diabetes mellitus is a redundant health problem because it is one of the most frequent chronic diseases, causing several acute complications (ketoacidosis, hyperglycemia, hypoglycemia) and chronic complications (retinopathy, nephropathy, neuropathy, ischemic cardiopathy) diminishing the quality of life. <sup>(1)</sup>

According to the National Health and Nutrition Survey <sup>(1)</sup>, there are about 6.5 million people who report having been diagnosed with diabetes, and according to the National Institute of Statistics and Geography <sup>(2)</sup> in children under 10 years there is an incidence of 3.83 per 100 thousand inhabitants and 10 to 14 years is 10.85 per 100 thousand inhabitants.

These evidences confirm that Type 2 Diabetes Mellitus (DM2) is not exclusive for adults, but it also affects the children population, it is well known that the risk factors for DM2 are included in the family history of the disease, the high or low birth weight; nevertheless, the most prevalent risk factors are the overweight and the obesity, reports indicate that 34 percent of children are overweight and obese, and in recent years it has been increased by 124 percent the presence of obesity in Mexican children in turn caused by the acquisition of unhealthy habits and deficient physical activity. <sup>(1)</sup>

The increase of overweight and obesity in children is the result of multiple factors that influence lifestyle <sup>(3, 4)</sup>, accordingly, studies suggest that family income is related to the child's weight, which means, the lower the income, the greater chance of developing obesity and therefore the risk of developing DM2 is higher. <sup>(3, 5)</sup>

It has been found that mothers with higher schooling levels tend to have children with lower risk of BMI, in comparison with children, whose mothers have low schooling levels, with higher BMI. <sup>(6)</sup>

Additional studies have documented an association with mothers who work outside the home with the increase of children developing obesity. <sup>(7)</sup>

These factors, which affect the lifestyle, are closely related to parenting or upbringing, since they affect the nutrition and physical activity of children through practices, styles and strategies <sup>(8)</sup>. It is known that parental strategies of nutrition and physical activity such as inculcating physical activity and a proper nutrition are really important and even more in the childhood, however, little has been examined about the parental strategies of nutrition and physical activity that parents do to their children to prevent DM2.

Eating habits and sedentary behaviors are acquired in childhood, and for later being very difficult to modify, which is why, the influence of the family environment on the development of these behaviors is decisive: children observe how their parents eat, and also the parents stimulate the active or the sedentary behavior of the children. <sup>(9)</sup> When parents create environments for their children, they both can encourage the development of healthy behaviors and also promote the overweight and eating disorders, the relationship between parents and children is a fundamental fact in these aspects. <sup>(10)</sup>

The relationships that parents establish with their children have as a result a set of behaviors that can be called parenting practices (6). When parents pursue to influence throughout techniques or behaviors in their children's food intake, Blissett mentions <sup>(12)</sup> that this concept is called parental feeding practices, this concept can also be applied to the physical activity that the child performs. <sup>(13)</sup>

The strategies of nutrition and physical activity are identified as: supervision, control, discipline, setting limits and reinforcement. Supervision refers to the level about how parents monitor their children's healthy behaviors. Discipline refers to the frequency about how parents punish kids for unhealthy behaviors. Control refers to the ability or the power of parents to have their children perform what is desirable. Setting limits refers to the measurement about how parents allow children unhealthy eating and sedentary behavior. And reinforcement refers about how parents praise their children when they have healthy behaviors. <sup>(13)</sup>

It has been reported that the maternal control has increased the risk of having childhood obesity <sup>(14)</sup>, therefore, other studies have reported that maternal control decreases unhealthy food intake, increase consumption of healthy foods, and reduce the child's weight, measured mainly by a higher schooling level and a higher family income. <sup>(15)</sup>

A number of effective maternal strategies may reduce the risk of type 2 diabetes mellitus in schoolchildren. Parental supervision, discipline, setting limits, having control and reinforcement in dietary intake and physical activity has been associated with healthy practices in children. <sup>(8)</sup>

In spite of the prior text, in Mexico, especially in Nuevo Leon, the evidence is insufficient and contradictory, which is the reason of this study.

### **Objectives of study**

The purpose of the study was to learn maternal nutrition and physical activity strategies to prevent DM2 and to describe the weight of the schoolchild as an example of mother-child dyads in the community of Sabinas Hidalgo, in order to know which strategies can mothers do to their schoolchildren to prevent this disease and its link with the weight of the kid.

## **MATERIALS AND METHODS**

### **Study design**

The study design was descriptive given that it is only intended to describe and document a situation that occurs in a natural way <sup>(16)</sup>.

### **Population, sampling and sample**

The study population consisted of 30 mothers of schoolchildren from the Niños Héroes Elementary School, which is located in the community of Sabinas Hidalgo, Nuevo León. The simple random sampling used a random number table <sup>(17)</sup>.

### **Procedure for the selection of participants**

For the realization of the present study, it was counted with the authorization of the Ethics Committee of the institution where the researchers work and with the participating educational institution where the contact with the mothers of the family was.

For the selection of the participants, the data of the students was obtained through the authorities of the School. After, the selection was calculated considering the data obtained, the selection process of each participant was supported by the random number table.

An informational meeting was planned with the mothers in the educational institution to where their children attend, the objectives of the study were explained, the purpose of the study and the procedures to be performed, the signing of informed consent was requested and they were given the opportunity to refuse if they so wished. The mothers who agreed to participate and gave their written consent, were provided with a questionnaire and were explained the filling of it which was returned properly filled the same day. They were asked to fill in a correct form the personal data of the mother and the child and the Parenting Strategies for Eating and Activity Scale (PEAS) questionnaire.

In a special area provided by the elementary school management, anthropometric measurements of the children were carried out by those responsible for the research.

### **Measurements**

The Spanish version of the Parenting Strategies for Eating and Activity Scale (Estrategias Parentales para la Alimentación y la Actividad) developed by Larios <sup>(14)</sup> was used. The scale measures the parental strategies about nutrition and activity, has 26 reagents, which are organized into five subscales: (1) establishment of limits with six items, (2) control with six items, (3) supervision with seven items, (4) discipline with 5 items, and (5) reinforcement with two items.

The scale of response is Lickert type of 5 points, the limits and control subscales are answered based on the degree of agreement, where one indicates disagreement and five indicates agreement with the statement. The supervision, discipline and reinforcement subscales are answered based on the degree of frequency, where one

indicates that the strategy is never performed, and five indicates that the parental strategy is always performed.

The scores for each factor of the PEAS scale are converted to indices from 0 to 100 and descriptive statistics are obtained. The 5-point Likert score yielded the maximum value 100, where  $100/5 = 20$ , giving a result of 20 points for each response, where 1 = 20, 2 = 40, 3 = 60, 4 = 80.5 = 100.

Each score represents the average for each strategy. The scale represents the strategies focused on nutrition in 16 items and the strategies on the activity of the child in 10 items, Nutrition: Setting limits 5, 6, Supervision 8, 9, 10, 12, 13, Discipline 16, 17, 18, Control 19, 20, 21, 22, 24, Reinforcement 26, Physical Activity: Setting limits 1, 2, 3, 4, Supervision 7, 11, Discipline 14, 15, Control 23, Reinforcement 25. The concurrent validity of construct, content and predictive are reported. The reliability reported by subscales ranges from .73 to .87. The PEAS scale has a Cronbach's alpha confidence of 0.84<sup>(14)</sup>.

The weight was obtained with a SECA brand scale with a maximum capacity of 200 kilograms with a difference of 0.1 kilograms, the children's clothing was as light as possible and they were asked to remove their shoes before going up the scale. The size was obtained with a SECA brand height rod with maximum limit of 2.10 meters, the children without shoes and with the feet together by the heels, without tilting the head up or down. During this procedure, safety measures were taken.

### **Ethical considerations**

The present study was adhered to the Regulation of the General Law of Health in the Field of Health Research<sup>(18)</sup>.

### **Data analysis**

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20, descriptive statistics were used and also the average, the standard deviation, as well as the use of frequencies and percentages was used for respond to the research objective.

## **RESULTS**

30 mothers participated. Maternal age ranged from 24 to 56 years old, average age 38.77 years (SE = 8,245), in respect to education, the participants had an average of 12.45 years (SE = 0.679) of schooling. Fifty percent of the mothers studied until junior high school, 85% were married, and 76.70% were dedicated to the home and 23.3% worked outside the home, most of them working in a non-professional way. They reported an average family economic income of \$ 6,300.00 M.N. (SE = 3,064,316). Regarding the children, the age oscillated from 7 to 11 years, average age 9.20 years (SE = 1,270), 53.3% male and 46.7% female (Table I).

**Table I. Sociodemographic data of the mother's child**

		<i>f</i>	%
Schooling	Elementary	4	13.13
	Junior High	15	50.00
	High school	6	20.00
	Career	5	16.70
	Technical	5	16.70
	Professional	0	0
Marital status	Single	1	03.30
	Married	25	83.30
	Divorcee	2	06.70
	Widow	0	0
	Cohabitation	2	06.70
Occupation	Home	23	76.70
	Employee	7	23.30
Children's total number	1 child	6	20.00
	2 to 3 children	18	60.00
	4 to 5 children	6	20.00
Monthly family income	>5,000	11	36.70
	5,000-10,000	17	56.70
	10,001-15,000	1	03.30
	<15,000	1	03.30

Regarding to the Nutrition State (NS) measured by the BMI classified by age and sex according to what is established in the National Health Charts for girls and boys from 0-9 years and adolescents from 10-19 years in Mexico, which are based on the WHO proposed that 80% of the children presented normal weight (40% boys and 40% girls), also a 10% presented overweight (OW) and another 10% obesity (OB) (6.6% boys and 3.3% girls). The information is given in the Table II.

**Table II. Nutrition status of the child according to sex**

Sex BMI	Boys		Girls		Total	
	<i>f</i>	%		%	<i>f</i>	%
Low weight	0	0.0	0	0.0	0	0.0
Normal weight	12	40.0	12	40.0	24	80.0
Overweight	3	10.0	0	0.0	3	10.0
Obesity	2	6.6	1	3.3	3	10.0
Total	17	56.6	13	43.3	30	100

Regarding the education level of mothers and their occupation, it was found that the majority of the children showed normal weight, only 6 children were overweight or obese (Table III and IV).

**Table III. Body mass index of the child according to the mother's educational level**

Mother's schooling	Elementary		Junior High		High School		Technical Career	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
Low weight	0	0.0	0	0.0	0	0.0	0	0.0
Normal weight	3	75.0	12	80.0	5	83.3	4	80.0
Overweight	0	0.0	2	13.3	1	16.7	0	0.0
Obesity	1	25.0	1	6.7	0	0.0	1	20.0
Total	4	13.3	15	50	6	20	5	16.6

**Table IV. Body mass index of the child according to the mother's occupation**

Mother's occupation	Home		Employee	
	<i>f</i>	%	<i>f</i>	%
Low weight	0	0.0	0	0.0
Normal weight	18	59.9	6	20
Overweight	2	6.6	1	3.3
Obesity	3	10	0	0.0
Total	23	76.6	7	23.3

Regarding the study objective, it was found that the highest average was Reinforcement with a  $\bar{x}$  of 64.00 (SE = 18.84) which is aimed at praising children when they perform healthy behaviors, and the lowest was Supervision with 51.33 (SE = 20.80) which is defined as the degree in which parents supervise their children's healthy behaviors. The information is shown in Table V.

**Table V. Descriptive statistics of PEAS scale strategies**

Strategies	$\bar{x}$	SD
Limits	63.66	18.84
Supervision	51.33	20.80
Discipline	54.66	24.40
Control	59.33	19.28
Reinforcement	64.00	24.8
Description:	$\bar{x}$ = Average	SE = Standard deviation

Regarding the BMI, the gender of the child and the maternal strategies of nutrition and physical activity, it was found that in the case of children the Control and Limits strategies were those that demonstrated higher averages ( $\bar{x}$  = 66.6) this for those who had normal weight and overweight, respectively. In the case of girls, the main strategies that mothers take to prevent DM2 are Limits and Reinforcement (71.6% vs 75.8%), both in girls with normal weight.

**Table VI.** *Child's Body Mass Index according to Gender and Maternal Nutrition and Physical Activity Strategies*

Sex	BMI	Limits	Supervision	Discipline	Control	Reinforcement
		$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$
M	Low weight	0.0	0.0	0.0	0.0	0.0
	Normal	55.8	48.4	53.4	66.6	60.0
	Overweight	66.6	53.4	60.0	50.0	56.6
	Obesity	60.0	40.0	50.0	45.0	50.0
F	Low weight	0.0	0.0	0.0	0.0	0.0
	Normal	71.6	58.4	58.4	60.0	75.8
	Overweight	0.0	0.0	0.0	0.0	0.0
	Obesity	60.0	20.0	20.0	20.0	20.0

Table VII shows that mothers use the five strategies, especially in overweight children.

**Table VII.** *Child's Body Mass Index according to Gender, Nutrition (NU) and Physical Activity (PA)*

Sex	BMI	Limits		Supervision		Discipline		Control		Reinforcement	
		$\bar{x}$		$\bar{x}$		$\bar{x}$		$\bar{x}$		$\bar{x}$	
		NU	PA	NU	PA	NU	PA	NU	PA	NU	PA
M	Low weight	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Normal	51.6	54.2	48.4	48.4	48.4	60.0	70.0	60.0	63.4	56.6
	Overweight	60.0	66.6	53.4	53.4	53.4	63.4	53.4	63.4	60.0	53.4
	Obesity	40.0	60.00	40.0	40.0	40.0	60.0	40.0	60.0	50.0	50.0
F	Low weight	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Normal	66.6	70.8	58.4	58.4	56.6	64.2	65.0	64.2	76.6	75.0
	Overweight	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Obesity	60.0	60.0	20.0	20.0	20.0	20.0	20	20	20.0	20.0

## DISCUSSION

The maternal strategies of nutrition and physical activity to prevent type 2 diabetes mellitus in schoolchildren were known in a sample of 30 mothers.

Describing the Maternal Strategies for Nutrition and Physical Activity, it was identified that Reinforcement was the strategy most referred by mothers, which is aimed at praising children when they perform healthy behaviors, and the lowest value was Supervision that is defined as the degree in which parents supervise the healthy behaviors of their children.

Having obtained the highest value in the Reinforcement strategy, it can be inferred that most mothers respond positively to the strategy. Nevertheless, the authors of the PEAS scale have pointed out that this strategy has a limitation since it only has two items to evaluate, it could cause that this strategy not to be measured adequately or accurately <sup>(14, 19)</sup>.

Mothers with a high schooling level maintain a better weight in their children, whereas mothers who only studied until elementary school have a higher percentage of children with obesity.

The employed mothers promote more health in their children, since a high percentage was found with respect to the normal weight, and the mothers who are dedicated to the home were a smaller percentage.

Regarding to the BMI, the gender of the child and the maternal strategies; it was found that male children's mothers prefer to have their children perform what is desirable (Control) in relation to children who present normal weight. And in relation to the daughters the mothers prefer to praise their daughters when they perform healthy behaviors (Reinforcement) in relation to the normal weight daughters. That is, it is effective for mothers to have their children do what is desirable in boys, and in girls it is effective for mothers to praise them when they perform healthy behaviors.

In relation with male gender nutrition, mothers refer to having their children perform what is desirable (Control) and girls' mothers refer to praise their daughters when they perform healthy behaviors (Reinforcement), this is in relation with a normal weight child. Regarding to physical activity in children, it was found that mothers prefer to sanction for unhealthy behaviors (Discipline) and Control, in girls' mothers report praising their daughters when performing healthy behaviors (Reinforcement) with respect to normal weight.

In a study by Flores-Peña <sup>(19)</sup> was found that Reinforcement presented the highest average (62.72) and Control the lowest (50.07), similar data were found in this study since according to the authors of the PEAS scale this strategy counts with a limitation since it only has two items to evaluate it, this caused that the strategy in both studies was not measured properly or accurately.

Lloyd <sup>(20)</sup> found that Control, Limits, and Reinforcement strategies were significantly associated with nutrition, Reinforcement was significantly associated with infant physical activity. In the present study it was found that Control and Reinforcement strategies obtained higher averages respect to Nutrition and in Limits, Supervision and Discipline, higher averages were found in relation to the Physical Activity questions. Possibly the differences found in both studies are directed in the geographical area where they were made, since in Mexico and Australia the mothers have different customs and cultures and also different strategies focused on the Nutrition and Physical Activity of their children.

Ortiz-Félix <sup>(3)</sup> in their results it was found a positive and significant correlation of Discipline in the diet and a negative and significant correlation in Control in nutrition. An opposite case happened in the present study finding that the Control strategy obtained a higher average in relation to the Nutrition and in Discipline a higher average was found in relation to Physical Activity. What could be inferred is that Mexican mothers prefer their children to do what is desirable in the Nutrition, and US mothers prefer to sanction their children for unhealthy behaviors in Nutrition, in contrast Mexican mothers prefer to sanction in the Physical Activity.

Considering only the mothers in this study may not give accurate results, but it is important to consider as participants of the study to other family members who also are responsible for the care and upbringing of children in cases where the mother is

outside the house for working; and to use instruments that allow to measure the styles of upbringing, using a classification of the breeding styles for example.

The findings of the present study of maternal nutrition and physical activity strategies: Establishment of Limits, Control, Discipline, Supervision and Reinforcement, found that mothers with overweight and obese children do not allow their children unhealthy feeding and sedentary behaviors (Limits), and mothers with normal weight children praise them when they perform healthy behaviors (Reinforcement). Granting a major limit to overweight and obese children and also giving a major reinforcement to children with normal weight.

## CONCLUSIÓN

Mothers further praise their children for performing healthy behaviors and exercise greater control over them to perform what is desirable in relation to Physical Activity and limit, monitor and sanction unhealthy behaviors in relation to Food.

Interventions aimed primarily at mothers are needed to educate them to exercise maternal strategies in a positive way and the risks associated with DM2, and especially to promote the promotion of proper diet and regular and healthy physical activity in order to prevent this disease.

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ISSN 1695-6141

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