LIFESTYLE CHANGES IN DESCENDANTS OF PARENTS WITH DIABETES TYPE 2

Rosalinda Guerra-Juárez[1]
Esther C. Gallegos[2]
Ricardo M. Cerda-Flores[3]

Guerra-Juárez R, Gallegos EC, Cerda-Flores RM. Lifestyle changes in descendants of parents with diabetes type 2. Rev Latino-am Enfermagem 2007 setembro-outubro; 15(5):909-13.

This study aimed to explore the disposition of diabetic parents' descendents in changing eating and physical activity patterns. It was based on the heritability concept and Prochaska's Transtheoretical Model. This is a descriptive-correlational study; participants included 30 parents, randomly selected, and 60 children. Results and conclusion: 68% of the children was classified as obese, 42% with insulin resistance, and 15% with carbohydrate intolerance. None of the risk factors was associated with the stages of change. The heritability factor was 1.37%; more people younger than 40 and women report decreasing in the consumption of fat food (χi^2 = 6.04, p = .020; and 4.41, p = .040, respectively). These results suggest a high influence of environmental factors on the participants' unhealthy life styles.

DESCRIPTORS: health behavior; environment; heredity

CAMBIO EN LOS PATRONES DE VIDA EN DESCENDIENTES DE PROGENITORES CON DIABETES MELLITUS TIPO 2 DEL NORESTE DE MEXICO

El objetivo general del estudio fue explorar la disposición al cambio de patrones alimentarios y actividad física en descendientes de progenitores con diabetes mellitus tipo 2 (DMT2), aplicando un diseño descriptivo correlacional. La base teórica la constituyó el componente genético heredabilidad (h^2) y el Modelo Transteorético de Prochaska; participaron 30 progenitores con DMT2 y 60 descendientes. Resultados y Conclusión: El 68% de los descendientes fueron obesos, 60% con riesgo de enfermedad cardiovascular, 42% con resistencia a la insulina (RI) y 15% intolerantes a la glucosa; ninguno de los factores de riesgo se asoció con las etapas de cambio. El componente genético para RI fue mínimo (h^2 = 1.37%). Una mayor proporción de menores de 40 años (p = .020) y de mujeres "contemplan" disminuir el consumo de grasas (p = .040). Estos resultados sugieren un mayor peso de factores del medio ambiente sobre el estilo de vida nocivo de los participantes.

DESCRIPTORES: conducta de salud; medio ambiente; herencia

MUDANÇA EM OS PADRÕES DE VIDA EM DESCENDENTES DE PROGENITORES COM DIABETES MELLITUS TIPO 2 DO NORDESTE DO MEXICO

O objetivo geral do estudo foi explorar à disposição à mudança dos padrões alimentares e atividade física nos descendentes de progenitores com diabetes mellitus tipo 2 (DMT2). Aplicou-se un desenho descritivo correlacionar. A base teórica constituiu-se pelo Componente Genético (h^2) e o Modelo Transteorético de Prochaska. Participaram 30 progenitores com DMT2 e 60 descendentes. Resultados e Conclusões: O 68% dos descendentes presentaram obesidade, 60% com risco de doença cardiovascular, 42% com resistência à insulina (RI) e 15% intolerância à glucose; nenhum dos fatores de risco associaram-se com as etapas de mudança. O componente genético para RI foi mínimo (h^2 = 1.37%). Uma maior proporcão dos menores de 40 anos (χi^2 = 6.04, p = .020) e das mulheres (χi^2 = 4.41, p=.040) contemplam diminuir o consumo de gorduras. Os resultados sugerem um maior peso dos fatores do meio ambiente sobre o estilo de vida nocivo dos participantes.

DESCRITORES: conduta de saúde; meio ambiente; hereditariedade

[1] Sc.M. in Nursing Sciences, Full time Professor, University Autónoma de Cd. Juárez, Chihuahua, e-mail: lindaguerra@hotmail.com; [2] PhD, Full Professor, School of Nursing, University Autónoma de Nuevo León, Mexico, e-mail: egallego@fe.uanl.mx; [3] PhD, Primary Researcher, Genetics Division, Northeast Center of Biomedical Research, Mexican Social Security Institute, Mexico, e-mail: ricardocerda_mx@yahoo.com.mx

INTRODUCTION

Type 2 diabetes mellitus (DMT2) is a complex disease. Genetic and environmental components interact in its development. Different authors indicate that the environmental component exerts a greater weight in the high prevalence rates of this disease nowadays. The two main components of the environment that represent the highest risk for the population's health are foul eating habits and decreased physical activity. These conducts constitute living habits that need substantial modification in people suffering from or running the risk of DMT2[1].

Urban families' food is characterized by highly energetic items, rich in fats and sugars and poor in fibers, fruit and vegetables. Moreover, the characteristics of urban life practically impose a sedentary lifestyle on its inhabitants, avoiding walks, sports and making less effort for work and housework[2].

DMT2 is diagnosed earlier and earlier and, in many cases, in individuals whose close relatives are diabetic[3]. Health system offer the means to control adults with this disease, but few efforts and resources are available to attend to their descendants, which per definition are at risk of developing this chronic disease.

Literature shows that, in more than 50% of adults with DMT2, glucose levels are much higher than recommended or expected levels. If they followed the prescribed treatment strictly, including a balanced diet with control of calorie ingestion and sufficient physical activity, a balance could be maintained between calorie intake and consumption[4]. This information suggests that neither adults with DMT2 nor their families have modified their eating and physical activity habits, which explains the bad metabolic control and shows, moreover, the high risk their direct relatives are running, especially their descendants, of developing DMT2 or another associated disease[3].

Besides this fact, there is an important increase in the prevalence of obesity and overweight in samples of adults as well as young people and school children, to the extent that this is already considered a public health problem[3-4]. Obesity has revealed to be one of the most relevant factors in insulin resistance (IR) disorders, which precede the clear appearance of DMT2[5]. Therefore, if direct relatives of an adult with DMT2 are also obese or overweight, the risk of developing the disease is higher[6]. On the other hand, there exists evidence about the prevention of DMT2 by incorporating changes in eating and in the physical activity level[7]. However, individuals at risk should know that they are facing an actual risk and be willing to change the conducts that favor and increment the risk of getting ill.

In Mexico, there are few studies about whether the direct relatives of people with DMT2 consider themselves at risk and take specific prevention measures. In general, the most studied themes are the families' support to the person with DMT2, with a view to following the recommended diet and exercises as a part of treatment[8]. However, they report on a negative attitude by the family in the sense of solidarity with adult patients who suffer from DMT2 in the observance of a balanced diet and accompaniment to increase physical activity. Moreover, only one study was located that inquired about the change phases in patients with DMT2, in the modification of fat and vegetable consumption[9].

This research was based on two concepts. First, inheritability (h^2), which is the proportion of variance in a phenotype that can be exclusively attributed to the effect of genes. Estimating h^2 is an essential phase before trying to locate the genes as, if the phenotype has no or a very low h^2 (lower than 10% for example), the search for genes has not been used because the environmental component would have a greater contribution. Factors like the Body Mass Index (BMI), Waist-Hip Ratio (WHR), cholesterol and triglycerides have been reported with significant h^2 levels in first, second and third-degree relatives in Mexican families[10]. Although we neither had an adequate sample nor a broad design of nuclear families to assess the genetic component (which decreases the study's statistical power), it seemed interesting to us to assess the h^2 of insulin resistance (IR) among parents with DMT2 and their descendants, in order to estimate the environmental contribution ($1-h^2$).

We adopted Prochaska's Transtheoretical Model, which explains the willingness to change[11]. This model considers that changing behaviors is a gradual process that involves five phases: a) Precontemplation, in which individuals have no intent to change in the near future; b) Contemplation, when individuals intend to change within the next six months; c) Preparation, when individuals are ready to change in the near future-less than a month; d) Action, when individuals have

changes their lifestyles, at least during the last six months; y e) Maintenance, when individuals have faith in the changes they have made and have less probability of relapse to unwanted behavior.

With a view to obtaining greater knowledge about the phenomenon of willingness to change in adults at risk of developing DMT2, this study aimed to explore the willingness to change health conducts, specifically in eating and physical exercise patterns in descendants of parents diagnosed with DMT2 and its association with some risk factors.

In view of the above, this study's specific objectives were: 1.-Calculate the hereditary-genetic and environmental component of IR in this sample of parents- descendants. 2.-Determine the prevalence of IR and glucose intolerance (GI) in descendants of DMT2 patients and 3.-Associate the change phases in fat consumption and exercise (Precontemplation, Contemplation, Action and Maintenance) with four risk factors (BMI, WHR, IR and GI) in descendants of DMT2 patients.

METHODS

The study design was observational and descriptive. The population of interest consisted of subjects who had at least one parent diagnosed with DMT2, medically controlled through outpatient treatment at a first-level social security institution in the Metropolitan Area of Monterrey (AMM), Nuevo León, Mexico. This is the country's second industrial zone, located in the Northeast of Mexico, with an immigrant population of 80% of people from the states of Tamaulipas, Coahuila, San Luís Potosí, Zacatecas, Durango, Veracruz and Chihuahua.

The research project was approved by the Institutional Review Board at the School of Nursing of the *Universidad Autónoma de Nuevo León*.

Test subjects (father or mother with DMT2) were selected at random: based on the updated lists of 22 clinics, a patient was selected. The selected parent should have descendants of 10 years old or older, excluding those already diagnosed with DMT2. The sample size was 100 subjects, with an estimated error of ± .09, 95% CI, p = 0.5 (conservative focus) for an association test. Fasting capillary glucose levels > 126 mgs/dl or post-charge levels ≥ 200 mgs/ dl were determined as an exclusion criterion, which eliminated four subjects.

Measurements. Two questionnaires were applied: a) Exercise-Change Phases Short Form[12], which measures the willingness to change in exercise patterns through five questions about the intent to exercise, current or past exercising. Dichotomic answers (T/F) permitted ranking the subject in one of the five change phases according to Prochaska and b) Fat Consumption-Change Phases Short Form, with four dichotomic-response questions, which measures the willingness to change the consumption of fatty foods; according to the answers, participants were classified in one of the four change phases (precontemplation, contemplation, action or maintenance).

The participants' weight and height was registered in ordered to calculate their BMI, using the formula: Weight/height^2, in function of which they were classified as normal weight, overweight and obese, according to criteria by the Official Mexican Standard for Integral Management of Obesity[13]. The waist-hip ratio was determined and subjects were classified as increased risk and substantially increased risk of obesity, according to gender.

In the test subjects' descendants, normoglycemia and glucose intolerance were determined, as well as an attempt to diagnose DMT2 through a pre and post-charge glucose test with 75 mgs. The colorimetric reaction technique in plasma was applied, using a Vitros DT II System device. Moreover, blood insulin was determined, using the enzyme-immunoassay method of micro-particles in serum with an IM X System device. In the parents, one single blood sample was taken to determine glucose and insulin levels. In parents and descendants, IR was calculated, using the formula HOMA IR= fasting insulin (U/ml) x fasting glucose (mg/dl)/45, considering IR when the coefficient was ≥ 3.5[14].

To calculate the heritability of IR, the SAGE (FCOR) package v4.6 was used[15]. Statistical Package for the Social Sciences (SPSS) version 11 was used for data analysis. Kolmogorov-Smirnov's test showed that the continuous variables adapted to a normal distribution. Chi-square statistics was used to look for associations. A probability level under 0.05 was considered significant.

RESULTS

The sample consisted of 60 participants, descendants of parents (father, mother or both)

diagnosed with DMT2. The mean age was 34 years (*SD* = 9; 13-63) and 58% were women. The mean number of years of formal education was 11.63 (*SD* = 3.38; 4-20); most parents (45%) indicated that they were employed and 60% lived with a partner. Fifty-six percent of this sample admitted having at least one grandparent with DMT2, 78% uncles on their father's side and 59% on their mother's side. Seventy-two percent mentioned that they did not practice any sports.

Only 15% of the 60 descendants demonstrated a BMI within normal levels[13]; while 68% presented obesity and 17% overweight. Sixty percent was classified as at increased risk of a cerebrovascular event (CVE). Based on the WHR, using the most direct indicators of metabolic disease, 42% of the sample of descendants was identified as having IR, and 15% obtained post-charge glucose levels that rank them as glucose intolerant.

As to the parents, 30 persons with a medical diagnosis of DMT2 were studied; this group included three couples in which both partners had DMT2. Hence, descendants were recruited from 27 families. The parents' mean age was 62 years (*SD* = 8; 47 - 80) and women predominated (67%).

Willingness to change in descendants of people with DMT2. Figure 1 presents the distribution of participants according to the change phase in fat consumption and exercise. The highest percentage in terms of fat consumption is found in the maintenance phase, followed by the precontemplation phase. What exercise is concerned, the highest percentages are found in the contemplation phase, followed by the maintenance phase.

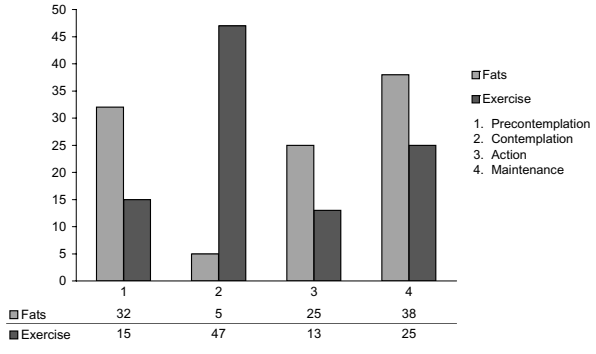

Figure 1 - Distribution of participants in change phases: consumption of gats and exercise

The genetic component of IR, assessed by calculating heritability, corresponded to 1.37%, while the environmental component was responsible for 98.63%. Forty-two percent of the descendants were insulin resistant, as shown in Figure 2. Moreover, 15% presented glucose intolerance.

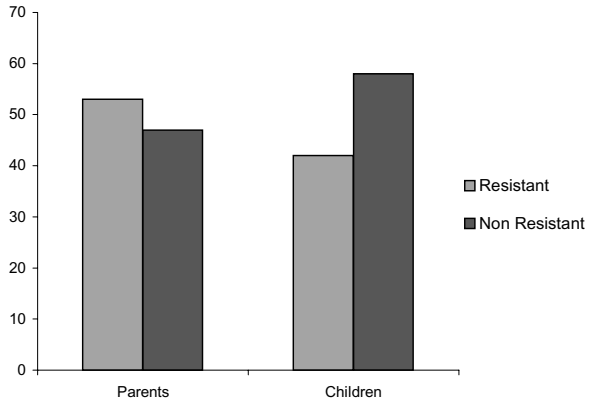

Figure 2 - Proportion of Resistant and Non-Resistant Parents and Children

When looking for the association between the risk factors BMI, WHR, IR and GI in descendants of parents with DMT2, with the change phases in fat consumption and exercise, using X^2 statistics with the previous dichotomization of each variables into the categories acceptable and non acceptable. The results were not significant, as shown in Table 1.

Table 1 - Association between risk factors and change phases in fat consumption and exercise

Risk factors	Change phases			
	Fat Consumption		Exercise	
	χi^2	P-Value	χi^2	P-Value
BMI	1.43	.290	0.69	0.48
WHR	2.34	.174	0.01	0.56
Resistance	0.40	.590	0.09	0.79
Tolerance	0.27	.710	0.16	0.72

When associated with the change phases in fat consumption, gender and age showed statistical significance, which indicates that women are "contemplating" the possibility of decreasing their fat consumption [χi^2 (1, n=60)=4.41, p=.04]. On the other hand, descendants younger than 40 are avoiding fat consumption and keep up this conduct [χ_i^2 (1, n=60)=6.04, p=.020].

DISCUSSION

An important percentage of the participants had no intent whatsoever on decreasing the fat

consumption in their food and an even larger part had no intent (precontemplation) or intended to do something about (contemplation) exercising in the next six months.

A change in this sample's diet, particularly in their fat consumption, and in their physical exercise pattern would be a strategy that helps to delay DMT2, as some authors have demonstrated[7]. Balancing calorie ingestion and spending is the best combination to manage excess body weight; in turn, losing weight is one factor that can decrease visceral fat and eventually decrease IR at hepatic and muscular level. However, about half of the descendants of parents with DMT2 who participated in this research did not seem to consider this change as necessary for them.

When analyzing the presence of other risk factors besides the fact of being a direct descendant of one (or both) parent(s) with DMT2, a very high number of descendants was found with overweight and with a waist circumference of more than 84 cm, which places them in the category of increased risk of having a CVE.

On the other hand, the levels of IR and GI suggest that descendants are in a process of metabolic dysfunction, which will very probably manifest itself as DMT2. Moreover, it should be appointed that very few of these descendants are making changes in their fat consumption and exercise habits, showing a total lack of knowledge about the high risk they are running of developing a disease.

The fact that we did not find an association between the change phases and the levels of indicators like BMI, WHR, IR and GT indicates descendants' low willingness to make factual changes in their living patterns. This gives rise to the need to provide more in-depth information to first-degree relatives of patients with DMT2. This facilitates the understanding of the biochemical and anthropometric changes they can observe in themselves, which are imminent risk factors for developing the disease.

Finally, the high level found for the environmental component of IR (98.63%) indicates that the change in eating patterns and physical activity were the main contributing factors to metabolic and anthropometric changes in this sample.

REFERENCES

1. Walter S, Postonll C, Foreyt JP. Obesity is an environmental issue. Atheroesclerosis 1999; 146(2):201-9.

2. French SA, Story M, Jeffery RW. Environmental influences on eating and physical activity. Annual Rev Public Health 2001; 22:309-35.

3. Collazo C. Diabetes tipo 2 en niños. Obesidad Infantil. Diabetes Hoy 2004; 18-20.

4. Gallegos EC, Bañuelos Y. Conductas protectoras de salud en adultos con diabetes mellitus tipo II. Invest Educ Enfermería 2004; 22(2):40-9.

5. Dushay J, Abrahamson MJ. Insulin resistance and type 2 diabetes: A comprehensive review. CME/CE [serial online] 2005 abril [cited 2005 Jun 6]; 22: [9 screens]. Available from: URL: www.medscape.com.

6. Van der Sande M, Walraven G, Milligan P, Banya W, Ceesay S, Nyan O et al. Family history: An opportunity for early interventions and improved control of hypertension, obesity, and diabetes. Bull World Health Organization 2002; 79(4):321-8.

7. Diabetes Prevention Program Research Group. Achieving weight and activity goals among diabetes prevention program lifestyles participants. Obesity Res 2004; 12(9):1426-34.

8. Rodríguez-Morán M, Guerrero-Romero JF. Importancia del apoyo familiar en el control de la glucemia. Salud Pública de México 1997; 39(1):44-7.

9. Vallis M, Ruggiero L, Greene G, Jones H, Zinman B, Rossi S et al. Stages of change for healthy eating in diabetes. Diabetes Care 2003; 26(5):1468-74.

10. Bastarrachea-Kent J, López-Alvarenga JC, Tejero E, Aradilla C, Brito-Zurita O, Machado-Dominguez A et al. Heritability of Cardiovascualr Disease (CVD) risk factors in Mexicans. Obesity. In press 2006.

11. Prochaska JO, Redding CA, Evers KE. The transtheoretical model and stages of change. In: Glanz K, Rimer BK, Lewis FM, editores. Health behavior and health education. San Francisco: Jossey-Bass A Wiley Imprint; 1997. p. 99-120.

12. Benisovich SV, Rossi JS, Norman GJ, Nigg, CR. Development of a multidimensional measure of exercise self-efficacy. Cancer Prevention Res Center 1998; 19(5 Suppl 190):561-75.

13. Estados Unidos Mexicanos Secretaria de Salud. Norma Oficial Mexicana para el Manejo Integral de la Obesidad. (NOM-174-SSA 1-1998). [serial online] 2004 marzo. Disponible en: URL:http://www.diabetesvida.com.mx/diabetesvida/NOM.ht.modificación.

14. Bonora E, Targher G, Alberiche M, Bonadonna R, Saggiani F, Zenere MB et al. Homeostasis model assessment closely mirrors the glucose clamp technique in the assessment of insulin sensitivity. Diabetes Care 2000; 23(1):57-63.

15. SAGE. Statistical analysis for genetic epidemiology [computer program]. Cork (I): Statistical Solutions Ltd.; 2004.

Recebido em: 10.8.2006
Aprovado em: 4.6.2007