ORIGINAL ARTICLE

Diabetes education and self-care behaviors in patients with diabetes in Mexico

Educación en diabetes y comportamientos del autocuidado en pacientes con diabetes en México

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ABSTRACT

Background: Diabetes educators are an important element in the multidisciplinary treatment team of diabetes. Diabetes education interventions are recommended throughout the course of the disease since they have a favorable impact in glucose control. **Objective:** The objective of the study was to evaluate the baseline status and at follow-up of patients participating in diabetes education sessions. **Methods:** Retrospective cohort study based on the review of clinical records of patients from a National Health Institute in Mexico. A total of 153 subjects that attended individual sessions were included in the study. Changes were assessed in 48 participants that had a second evaluation. The outcomes included clinical, anthropometric, and biochemical parameters, along with variables related to diabetes education. **Results:** The knowledge about tools for diabetes self-management was poor. Significant changes were found in different components that promote self-management of diabetes including knowing glycemic targets, performing an adequate insulin injection, and practicing self-monitoring of blood glucose. **Conclusions:** The knowledge of patients with diabetes about their disease is inadequate. Interventions related to diabetes education could promote better adherence to self-care behaviors in patients with diabetes.

Key words: Diabetes mellitus. Health education. Public assistance. Blood glucose self-monitoring. Hypoglycemia.

RESUMEN

Introducción: Los educadores en diabetes son un elemento importante en el equipo multidisciplinario para el tratamiento de la diabetes. Las intervenciones de educación en diabetes se recomiendan a lo largo de la enfermedad debido a que tienen un impacto favorable en el control glucémico. **Objetivo:** Evaluar el estado basal y al seguimiento de pacientes que participaron en sesiones sobre educación en diabetes. **Métodos:** Cohorte retrospectiva basada en revisión de expedientes clínicos de pacientes de un Instituto Nacional de Salud en México. Fueron incluidos en el estudio 153 individuos que recibieron sesiones individuales. Se analizaron cambios en 48 participantes que tuvieron una segunda evaluación. Los desenlaces incluyeron parámetros clínicos, antropométricos y bioquímicos, junto con variables relacionadas con educación en diabetes. **Resultados:** El conocimiento acerca de las herramientas para el autocuidado en diabetes es pobre. Se encontraron cambios significativos en diferentes componentes que promueven el autocuidado en diabetes, incluyendo conocer las metas de control glucémico, realizar una técnica correcta de aplicación de insulina y practicar automonitoreo de glucosa. **Conclusiones:** El conocimiento en pacientes con diabetes en México es inadecuado. Intervenciones de educación en diabetes podrían promover mayor adherencia a conductas de autocuidado.

Palabras clave: Diabetes *mellitus*. Educación en salud. Asistencia pública. Automonitoreo de glucosa. Hipoglucemia.
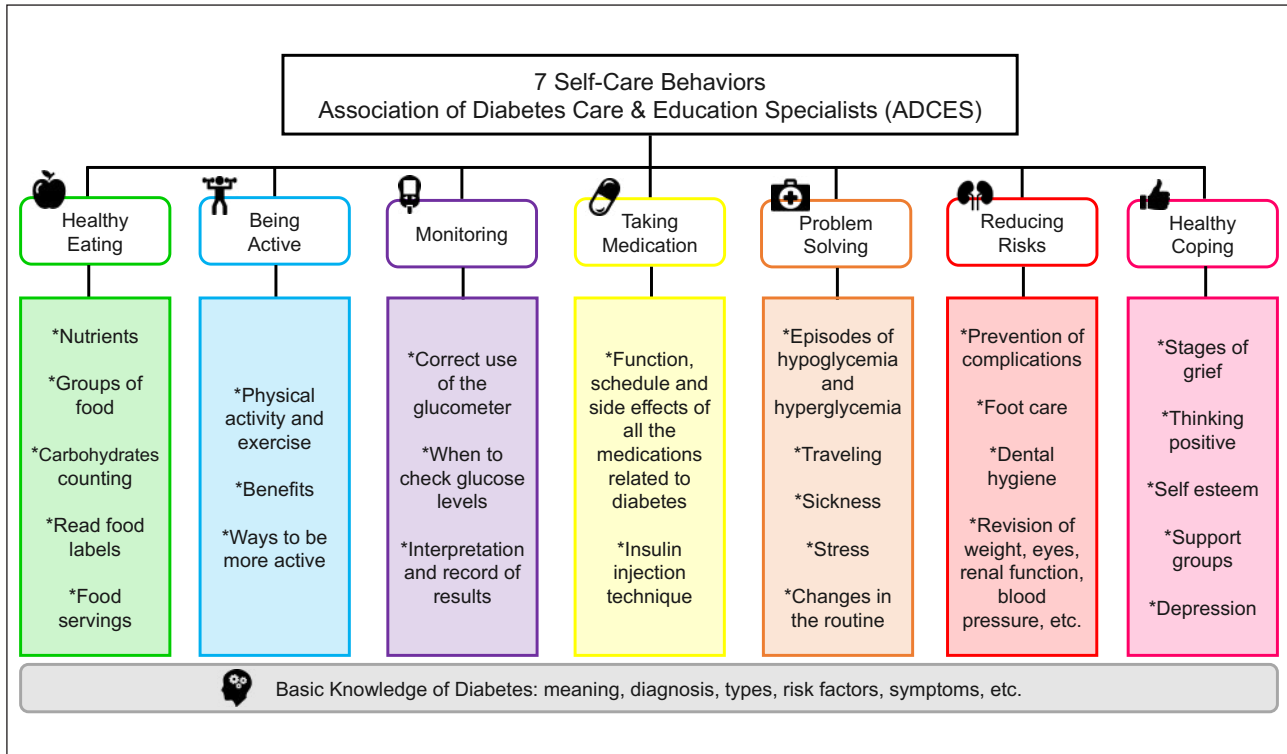
Figure 1. Description of each of the seven self-care behaviors of diabetes along with basic knowledge about diabetes in accordance to the Association of Diabetes Care and Education Specialists.

INTRODUCTION

Diabetes education is a process in which patients with diabetes acquire knowledge and skills to change behaviors and are empowered in the self-management with the aim of improving glucose control and preventing complications[1]. The diabetes educator is an essential member within the multidisciplinary team to treat diabetes[2,3]. Any health professional that has been trained in the seven self-care behaviors of diabetes (Fig. 1) established by the American Association of Diabetes Educators, currently named Association of Diabetes Care and Education Specialists can be a diabetes educator[4]. Diabetes education emerged before the discovering of insulin, when malnutrition in people with diabetes was common because due to periods of fasting to avoid ketoacidosis and glycosuria. Nurses in charge of the "starvation therapy" began to specialize in diabetes and took a role in education[5]. Frederick Banting and Charles Best, in collaboration with John Macleod, isolated and extracted insulin in 1921[6]. In 1923, when insulin became available for use, the need of health professionals to teach patients to administer insulin, count carbohydrates, and monitor glycosuria turned into a priority. Later, Dr. Elliot Proctor Joslin recognized the importance of educating nurses in diabetes and became a pioneer in the training of certified diabetes educators[5]. The American Diabetes Association highlights that diabetes self-management education and support are relevant to prevent or delay type 2 diabetes, as well as to facilitate knowledge and informed decision-making in diabetes[7]. Diabetes education promotes lowers glycated hemoglobin (HbA1c), improves quality of life, reduces all-cause mortality risk, and diminishes health-care costs[8-12]. The aim of this study is to describe some aspects of the knowledge about self-care behaviors in patients that assisted to diabetes education sessions in a National Health Institute in Mexico and to compare the changes in a subset that attended a second evaluation.

MATERIALS AND METHODS

Description of participants

Participants included in the study attended individual sessions concerning diabetes education at the Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán. The criteria to participate in the sessions include any type of diabetes, age ≥ 18 years, and one or more of the following: (1) HbA1c ≥ 8.5%, (2) problems with the insulin injection technique, or (3) recurrent hypoglycemia.

Study design

This was a retrospective cohort study. Data from the electronic database of the clinical files of participants were evaluated from June 2017 to December 2018. Patients who had most of the data for the study were included in the analysis (n = 153). Changes at follow-up were evaluated in 48 subjects that had a second evaluation.

Outcomes

Sociodemographic data included sex, age, and education level. Clinical variables considered were type of diabetes, disease duration, hypertension, smoking habit, exercise, blood pressure, and heart rate. Other variables obtained were hypoglycemia-induced falls, episodes of severe hypoglycemia, and hospitalizations due to hypoglycemia or hyperglycemia. Anthropometric measurements recorded were weight, height, and waist circumference. Body mass index (BMI) was calculated and classified (normal weight, overweight, and obesity) according to the World Health Organization. Abdominal obesity was established using the cutoff values established by the International Diabetes Federation for Latin Americans (waist circumference ≥ 80 cm in women or ≥ 90 cm in men). Biochemical parameters included fasting glucose, HbA1c, total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides, creatinine, and urinary albumin-to-creatinine ratio. These

analyses were performed < 1 month before the consultation. A capillary glucose concentration was measured during the consultation and was classified in three categories: (1) at fasting, (2) post-prandial < 2 h, and (3) post-prandial ≥ 2 h. Reasons for consultation were grouped in five categories: (1) glycemic control, (2) insulin application, (3) recurrent hypoglycemia, (4) glucometer use, and (5) carbohydrate counting. Variables related to diabetes education included knowledge of pre-prandial and post-prandial glycemic targets and glucose concentration to define hypoglycemia[13]. This information was classified in three categories: (1) does not know, (2) correct answer, and (3) incorrect answer. Insulin application was classified in four categories: (1) not required, (2) starts using insulin, (3) correct technique, and (4) incorrect technique. Self-monitoring of blood glucose (SMBG) was classified in four categories: (1) does not perform, (2) adequate (≥ 2 times/week) and make changes in case of hypoglycemia or hyperglycemia, (3) adequate but does not make changes, and (4) inadequate. Sick days were classified into three categories: (1) did not present, (2) presented and performed actions (sufficient hydration, increased SMBG, and continuing diabetes medications), and (3) presented and did not perform actions. Finally, hypoglycemia was classified in five categories: (1) did not presented, (2) pseudohypoglycemia (symptoms but glucose concentration ≥70 mg/dL), (3) probable symptomatic hypoglycemia (glucose concentration not documented), (4) asymptomatic hypoglycemia documented, and (5) symptomatic hypoglycemia documented.

Description of procedures

The health professionals that provided the sessions were endocrinologists and dietitians certified as diabetes educators. The consultations were given individually, and the topics addressed in each session related to any of the self-care behaviors of diabetes (Fig. 1) in addition to the basic knowledge about diabetes, giving priority to the main problem for which the patient was referred. The duration of each consultation was approximately 45-60 min. The time between subsequent visits varied depending on the demand of the agenda and attendance

of patients. The instruments used included a SECA mechanical weight scale with height rod model 700, a Lufkin Executive Thinline diameter pocket tape measure (6 mm × 2 m) model W606PM, an Omron automatic digital blood pressure monitor model HEM-781INT, and a blood glucose meter FreeStyle model Optium Neo by Abbott Diabetes Care Ltd.

Statistical analysis

Variables distribution was evaluated with Kolmogorov–Smirnov normality test. Descriptive characteristics of the study population are reported as means ± standard deviations, medians (interquartile ranges) or frequencies, and percentages according to the nature and distribution. Changes in the participants subset that attended a second session were evaluated with paired t-test or Wilcoxon matched pairs test, as appropriate. Changes in categorical dichotomous variables were evaluated with McNemar's test and polychotomous variables with the extension McNemar-Bowker test. Data were analyzed using the IBM SPSS Statistics version 25.0 software. p < 0.05 was considered statistically significant.

RESULTS

Our population (n = 153) consisted mostly of women (68%) with an age of 54.8 ± 15.8 years. Most of the participants had type 2 diabetes (74.5%) and 84 subjects had hypertension (54.9%). More than half of participants (58.9%) practiced exercise, mainly aerobic, 5 days/week with a duration of 40 min per session. Reported hospitalizations were more frequent due to hyperglycemia versus hypoglycemia (19.0% vs. 5.2%). The sociodemographic and clinical variables are described in table 1. The BMI was 27.6 ± 4.7 kg/m^2 and 69.3% of the population had overweight or obesity, along with a prevalence of 77.1% of abdominal obesity. Most of the participants were out of targets for glycemic control, with a median fasting glucose of 172 mg/dL and HbA1c of 9.3%. Anthropometric and biochemical parameters are shown in table 2.

Table 1. Description of sociodemographic and clinical characteristics of the study population

	n = 153
Sex: women, n (%)	104 (68.0%)
Age (years)	54.8 ± 15.8
Education level, n (%)	
None	21 (13.7%)
Primary school	23 (15.0%)
Secondary school	28 (18.3%)
Higher education	22 (14.4%)
Technical career	14 (9.2%)
College	39 (25.5%)
Postgraduate	6 (3.9%)
Type of diabetes, n (%)	
Type 1 diabetes	30 (19.6%)
Type 2 diabetes	114 (74.5%)
Other specific types of diabetes	9 (5.9%)
Disease duration (years)	15 (8-23)
Diagnosis of hypertension, n (%)	84 (54.9%)
Smoking habit, n (%), (n= 90)*	10 (11.1%)
Exercise, n (%), (n= 90)*	
Yes	53 (58.9%)
Aerobic	51 (96.2%)
Anaerobic	2 (3.8%)
Days per week	5 (3-5.5)
Minutes per training	40 (30-60)
Systolic blood pressure (mmHg)	127 (112-142)
Diastolic blood pressure (mmHg)	79 (70-85)
Heart rate (bpm)	74 (68-84)
Hypoglycemia-induced fall events, n (%)	14 (9.2%)
Episodes of severe hypoglycemia, n (%)	25 (16.3%)
Hospitalizations due to hypoglycemia, n (%)	8 (5.2%)
Hospitalizations due to hyperglycemia, n (%)	29 (19.0%)

Quantitative variables are expressed in means ± standard deviations or medians (interquartile ranges) according to the data distribution. Categorical variables are described in frequencies and percentages.
*Data were not available in the total of the population.

The main reason to be referred to the diabetes education sessions was poor glycemic control (56.9%), followed by problems with the insulin injection technique (22.2%). A low proportion of participants knew the correct pre-prandial and post-prandial glucose target (8.5% and 19.0%, respectively), and approximately seven out of 10 participants did not know the glucose concentration to define hypoglycemia. About 30% of the population was going to start insulin application, 22.3% carried out an

Table 2. Description of anthropometric and biochemical characteristics of the study population

	n = 153
Weight (kg)	68.0 ± 14.1
Height (cm)	156.8 ± 1.0
Body mass index (kg/m^2)	27.6 ± 4.7
Category of body mass index, n (%)	
Normal weight	47 (30.7%)
Overweight	62 (40.5%)
Obesity	44 (28.8%)
Waist circumference (cm)	
Women	90.7 ± 12.7
Men	96.3 ± 13.8
Abdominal obesity, n (%)	118 (77.1%)
Fasting glucose (mg/dL)	172 (109-251)
HbA1c (%)	9.3 (7.9-10.7)
Total cholesterol (mg/dL)	175 (145-210)
LDL cholesterol (mg/dL)	101 (77-130)
HDL cholesterol (mg/dL)	49 (40-56)
Triglycerides (mg/dL)	136 (97-194)
Creatinine (mg/dL)	0.76 (0.63-0.97)
Urinary albumin-to-creatinine ratio (mg/g)	20.3 (5.6-121.0)
Capillary glucose concentration (mg/dL)	
Fasting	163 (118-257)
Post-prandial < 2 h	280 (173-393)
Post-prandial ≥ 2 h	180 (130-217)

Quantitative variables are expressed in means ± standard deviations or medians (interquartile ranges) according to the data distribution. Categorical variables are described in frequencies and percentages. HbA1c: glycated hemoglobin; LDL: low-density lipoprotein; HDL: high-density lipoprotein.

adequate insulin injection, and 18.4% were performing an inadequate application. Almost half of the participants (48.5%) did not perform SMBG or the frequency was low and most of the participants that practiced it, did not make changes with the results obtained. Of the 24 participants that presented sick days, only 11 performed correctly necessary actions during these days. In addition, only 16.5% had documented recent hypoglycemia (asymptomatic or symptomatic) and 16.3% had history of at least one episode of severe hypoglycemia. The description of variables related to diabetes education is presented in table 3.

The time between the first and second evaluation in the 48 subjects with a subsequent session was 25 ± 8.2 weeks (minimum 8 and maximum 55 weeks).

Table 3. Description of diabetes education variables of the study population

	n = 153
Reason for consultation, n (%)	
Glycemic control	87 (56.9%)
Insulin application	34 (22.2%)
Recurrent hypoglycemia	14 (9.2%)
Glucometer use	10 (6.5%)
Carbohydrates counting	8 (5.2%)
Pre-prandial glycemic target, n (%)	
Does not know	46 (30.1%)
Correct answer	13 (8.5%)
Incorrect answer	94 (61.4%)
Post-prandial glycemic target, n (%)	
Does not know	79 (51.6%)
Correct answer	29 (19.0%)
Incorrect answer	45 (29.4%)
Value to define hypoglycemia, n (%), (n = 134)*	
Does not know	56 (41.8%)
Correct answer	33 (24.6%)
Incorrect answer	45 (33.6%)
Insulin application, n (%), (n = 103)*	
Not required	29 (28.2%)
Starts using insulin	32 (31.1%)
Correct technique	23 (22.3%)
Incorrect technique	19 (18.4%)
Self-monitoring of blood glucose, n (%), (n = 103)*	
Does not practice	37 (35.9%)
Adequate and make changes	24 (23.3%)
Adequate but does not make changes	29 (28.2%)
Inadequate	13 (12.6%)
Sick days, n (%), (n = 103)*	
Did not presented	79 (76.7%)
Presented and performs actions	11 (10.7%)
Presented and does not performs actions	13 (12.6%)
Hypoglycemia, n (%), (n = 103)*	
Did not presented	72 (69.9%)
Pseudohypoglycemia	4 (3.9%)
Probable symptomatic hypoglycemia	10 (9.7%)
Asymptomatic hypoglycemia documented	5 (4.8%)
Symptomatic hypoglycemia documented	12 (11.7%)

Data are presented in frequencies and percentages.
*Data were not available in the total of the population.

Anthropometric parameters (weight, BMI, and waist circumference) remained unchanged; however, there was a tendency to a significant reduction in the systolic blood pressure (p = 0.05). A slight and almost
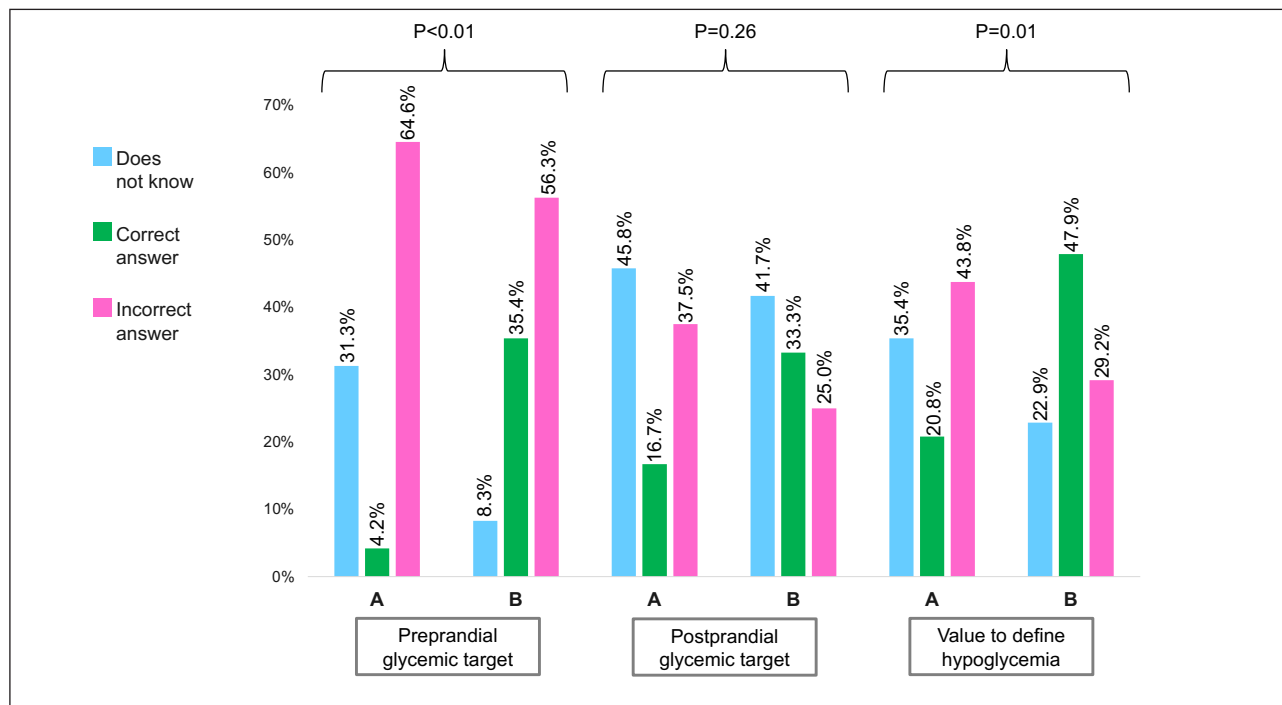
Figure 2. Changes in the knowledge of glycemic targets and the glucose concentration to define hypoglycemia in the participants that attended a second education session. Data are expressed in percentages and differences (p value) were evaluated with McNemar-Bowker test, (A) the first evaluation and (B) the second evaluation of each variable.

significant decrease in the HbA1c (p = 0.06) was observed (delta −0.31 ± 1.0% [95% confidence interval (CI): −0.64, 0.01]). A reduction in total, LDL, and HDL cholesterol (p < 0.05) was observed. The capillary glucose concentration at fasting and post-prandial < 2 h measured during the consultation showed a significant reduction between evaluations (p < 0.01). Figure 2 shows the changes in the knowledge about the pre-prandial glycemic target, post-prandial glycemic target, and the value to define hypoglycemia; the proportion of a correct answer increased from 4.2% to 35.4% (p < 0.01), from 16.7% to 33.3% (p = 0.26), and from 20.8% to 47.9% (p = 0.01), respectively. The prevalence of patients injecting insulin with an adequate technique increased from 16.7% to 45.8% (p < 0.01). A reduction of the participants who did not perform the SMBG was observed (from 31.3% to 12.5%), along with an increase in the proportion (from 14.7% to 50.0%) of participants performing an adequate SMBG and making actions according to the values obtained (p < 0.01). There was a tendency (p = 0.13) to a significant increase in performing correct actions during sick days (8.3% vs. 16.7%). Finally,

a non-significant reduction in the episodes of severe hypoglycemia and hospitalizations due to hyperglycemia was observed (p = 0.10 and p = 0.06, respectively). The changes between evaluations are reported in table 4.

DISCUSSION

This report shows that subjects that attended individual diabetes education sessions have poor knowledge about diabetes self-management. Positive changes in components that promote self-management of diabetes were found in the subset of individuals with a follow-up visit.

Nowadays, medical nutrition therapy, mental health, diabetes self-management education, and support are recognized as elementary components of the integral treatment of diabetes to improve patient care, reduce the risk of developing complications and health-care costs. It is advisable to provide diabetes

Table 4. Changes in different variables in a subset of the study population who attended a second diabetes education session (n = 48)

	First evaluation	Second evaluation	P
Weight (kg)	68.3 ± 13.6	68.0 ± 13.5	0.58 [a]
Body mass index (kg/m^2)	27.7 ± 4.0	27.0 ± 3.8	0.56 [a]
Waist circumference (cm)	92.6 ± 12.7	92.0 ± 10.4	0.61 [a]
Systolic blood pressure (mmHg)	133.5 ± 22.1	127.2 ± 21.5	0.05 [a]
Diastolic blood pressure (mmHg)	78.9 ± 12.6	76.9 ± 12.8	0.25 [a]
Heart rate (bpm)	76.5 ± 10.3	74.9 ± 10.8	0.39 [a]
Fasting glucose (mg/dL)	149 (101-229)	140 (110-198)	0.20 [b]
HbA1c (%)	9.3 ± 1.7	9.0 ± 1.7	0.06 [a]
Total cholesterol (mg/dL)	178 (150-208)	155 (136-195)	0.04 [b]
LDL cholesterol (mg/dL)	107 (82-131)	86 (65-122)	0.01 [b]
HDL cholesterol (mg/dL)	49 (37-55)	43 (38-49)	0.04 [b]
Triglycerides (mg/dL)	143 (98-207)	138 (95-183)	0.21 [b]
Creatinine (mg/dL)	0.77 (0.60-1.08)	0.78 (0.60-1.10)	0.68 [b]
Urinary albumin-to-creatinine ratio (mg/g)	24.8 (7.7-93.8)	15.5 (5.1-90.2)	0.90 [b]
Capillary glucose concentration (mg/dL)			
Fasting	212.2 ± 98.4	153.1 ± 51.0	<0.01 [a]
Post-prandial < 2 h	286.3 ± 101.1	193.5 ± 75.1	<0.01 [a]
Post-prandial ≥ 2 h	198.0 ± 110.2	195.0 ± 56.8	0.92 [a]
Insulin application			
Not required	19 (39.6%)	14 (29.2%)	<0.01 [c]
Starts using insulin	11 (22.9%)	5 (10.4%)	
Correct technique	8 (16.7%)	22 (45.8%)	
Incorrect technique	10 (20.8%)	7 (14.6%)	
Self-monitoring of blood glucose			
Does not practice	15 (31.3%)	6 (12.5%)	<0.01 [c]
Adequate and make changes	7 (14.7%)	24 (50.0%)	
Adequate but does not make changes	16 (33.3%)	16 (33.3%)	
Inadequate	10 (20.8%)	2 (4.2%)	
Sick days			
Did not presented	33 (68.8%)	37 (77.1%)	0.13[c]
Presented and performs actions	4 (8.3%)	8 (16.7%)	
Presented and does not performs actions	11 (22.9%)	3 (6.3%)	
Hypoglycemia-induced fall events, n (%)	6 (12.5%)	3 (6.3%)	0.37 [d]
Episodes of severe hypoglycemia, n (%)	9 (18.8%)	3 (6.3%)	0.10 [d]
Hospitalizations due to hypoglycemia, n (%)	3 (6.3%)	2 (4.2%)	1.00 [d]
Hospitalizations due to hyperglycemia, n (%)	9 (18.8%)	2 (4.2%)	0.06 [d]

Quantitative variables are expressed in means ± standard deviations or medians (interquartile ranges) according to the data distribution. Categorical variables are described in frequencies and percentages. HbA1c: glycated hemoglobin; LDL: low-density lipoprotein; HDL: high-density lipoprotein.
[a]paired *t* test, [b]Wilcoxon matched-pairs test, [c]McNemar-Bowker test, [d]McNemar's test.

education interventions at diagnosis with at least an annual assessment, when complicating factors impacting self-management appear and when transitions in care occur[14]. Despite this, not all health systems give sufficient importance to diabetes education, or it is not possible to provide a multidisciplinary treatment.

Different interdisciplinary team models in diabetes management have been developed; including endocrinologists, dietitians, diabetes educators, mental health professionals, nurse practitioners, pharmacists, dentists, foot care professionals, physical activity trainers, and eye care professionals, among others[2,3].

In this report, 69.3% of the study population were overweight or obese and 77.1% had abdominal obesity. This information agrees with data from national health surveys conducted in Mexico, showing a combined prevalence of overweight and obesity in 2018 of 75.2% and a prevalence of abdominal obesity in 2016 of 76.6%[15]. Although a high HbA1c was one of the criteria to be included in the education sessions, the values of fasting glucose and HbA1c observed in the participants are similar to data obtained in the Mexican population. It has been reported that only 31.8% of people living with diabetes in Mexico has a concentration of HbA1c <7%[16].

Results concerning the variables related to diabetes education showed a deficiency in the patients' knowledge about their disease. Only 8.5% and 19.0% of the study population knew correctly the pre-prandial and post-prandial glucose targets, respectively; along with 48.5% of participants not practicing or not frequently performing SMBG. This contributes to the lack of glycemic control because lack of assessment of glucose concentrations daily, and in those who perform SMBG lack of knowledge regarding how to interpret the results. This reflects that actions to improve glycemic control, to avoid hyperglycemia and hypoglycemia episodes are not performed.

HbA1c showed a tendency to decrease (-0.31% [95% IC: -0.64, 0.01], p = 0.06) and fasting and post-prandial < 2 h capillary glucose concentrations were significantly lower at follow-up. Similar effects have been reported in other studies and populations. A meta-analysis evaluating the impact of diabetes education interventions showed a reduction of 0.76% of HbA1c; however, after 4 months, the difference in HbA1c was reduced to 0.26%[8]. A systematic review included 118 interventions of diabetes self-management education and support, showing that 61.9% reported significant changes in HbA1c with an average reduction of 0.57%[9]. Greater reductions in HbA1c have been described in people with type 1 diabetes in comparison to people with type 2 diabetes[17].

Patients attending the education sessions showed significant changes in components that promote self-management of their disease including knowing glycemic targets, performing an adequate insulin injection technique, and practicing SMBG. These findings favor that diabetes education should be included routinely in the integral care of patients with diabetes, promoting empowerment, and making informed and appropriate decisions.

Limitations of this report should be acknowledged, this is an observational retrospective study, and the results were obtained with an analysis of secondary data of a heterogeneous population. The group of health professionals delivering the education sessions is trained as diabetes educators; however, the procedures performed in each consultation were not fully standardized. The impact of the education sessions was evaluated in a small subset of participants with a diverse follow-up period. Although some positive changes were observed, the effect of a single consultation was evaluated. Therefore, a structured long-term program with scheduled appointments could generate a higher impact.

A systematic review concluded that structured education interventions promote positive changes on glucose control and hypoglycemia[18]. Furthermore, a contact ≥ 10 h and a combination of group and individual sessions are associated to a greater impact in glucose control[9]. Long-term randomized clinical trials with well-structured and standardized diabetes education interventions are needed in countries like Mexico. A study conducted in Mexican low-income patients with type 2 diabetes reported that some of the challenges to promote self-management are cultural beliefs, personal control, and low health literacy[19]. According to the current worldwide evidence, it will be useful to implement effective diabetes education strategies that are more accessible to the general population at all levels of health care to reduce the incidence and progression of complications, mortality, and the costs derived from this disease.

CONCLUSIONS

The knowledge about diabetes in people living with it in Mexico is insufficient. Since a single session of diabetes education had a positive impact, interventions related to diabetes education could promote better adherence to self-care behaviors in patients

with diabetes and should be implemented in other health institutions.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

ETHICAL DISCLOSURES

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the informed consent of the patients and / or subjects referred to in the article.

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