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CASE REPORT

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The MIDE program provides an effective public health model to management chronic diseases

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Abstract

Background: *Despite the enormous number of resources assigned to diabetes mellitus, there is evidence which indicates that the results of its care are very poor, which is reflected in very low percentages of controlled patients among those who are suffering from this disease. The aim of the current research is to evaluate the technical efficiency and glycaemic control of the care model named "Integral Model of Diabetes by Stages" (MIDE), in uncontrolled patients from six Family Medicine Clinics located at the centre-western region of Mexico City (ISSSTE, Western Delegation).*

Methods: *An observational, and retrospective study was conducted under a purpose and perspective of standard impact and management evaluation.*

Results: *The last average levels of glucose were lower (n=1196; mean=138.97, (SD 56.74) compared to the glucose level at the beginning of the program (n=1196; mean=243.35, (SD 110.17). 50% of the patients (683; 57.1%, 95% CI 54.2-59.6) controlled their glucose levels (the percentage of controlled patients increased from 6.7 to 57.1%).*

Conclusions: The installation of integrated medical services specially designed for primary health care system, is important for a successful implementation; providing educational activities for healthcare staff and an empowerment program for patients and their families, which is a perfect complement to the glycaemic control and patient empowerment process.

Keywords: *type 2 diabetes mellitus; primary health care; health services; delivery of health care*

Introduction

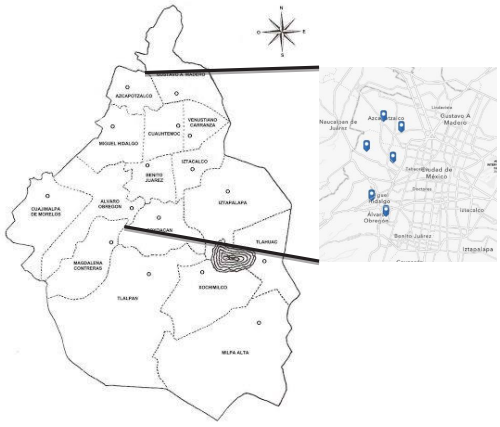
Type 2 diabetes (t2D) is a public health problem that increases the risk of death from infectious diseases, problems related to maternal and child health, and chronic diseases [1]. According to the National Diabetes Statistics 2020 report in the United State of America (USA), 34.2 million people of all ages in this country had diabetes (10.5%) [2]. Moreover, 7.3 million adults at 18 years old or older had undiagnosed diabetes, which represents the 2.8% of all adult population, and the 21.4% of all USA adults with diabetes [2]. In Latin America (LA), t2D has been increasing alarmingly, and it has become one of the top causes of death and premature disability in less than half a century [1,3]. The prevalence of t2D ranges from 1.2 to 8%, with higher prevalence rates in urban areas [3,4]. The frequency of diabetes in LA is expected to increase by 38% over the next 10 years, and the total number of cases is doubled [4]. Type 2 diabetes explains more than 90% of cases [3]. Moreover, the cases of diabetes are estimated in LA to exceed the number of cases in US, Canada, and Europe by 2025 [4]. The highest prevalence of t2D in LA and the Caribbean region (LAC) is located in the Caribbean, meanwhile the highest number of affected people are located in Mexico and Brazil [3,5]. Besides, the most economically vulnerable countries due to the disease are located in Central America and the Caribbean. In many places, only a minority of people receive a diabetes treatment, and currently, its prevention, diagnosis, and management are insufficient in LAC region [4-5]. In addition, there are several challenges in the region that do not allow to mitigate the impact of type 2 diabetes, which are associated with various factors underlined to its increase, within which include aging, increased life expectancy of the population, increased urbanization, lifestyle changes among Native American populations, social determinants of health, health inequity, life course, socioeconomic status, barriers and facilitators of access to health care, previous conditions, that increase the risk of diabetes and its complications in the midterm, patients undiagnosed that

affect the implementation of preventive actions against chronic complications, and the effectiveness of treatment programs are below the international standards, resulting in high expenditures for national health systems without changing the rates of premature disability and mortality [3,4]. In this context, Mexico has one of the highest direct medical costs within the countries that have a high prevalence of diabetes [5]. The objective of this study was to evaluate the effect that the program "Integrated Management of Diabetes in Stages" (Manejo Integral de la Diabetes por Etapas, MIDE, by its acronyms in Spanish) has produced in the metabolic control of diabetes in uncontrolled patients from six Family Medicine Clinics which belong to the first level of care from the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE, by its acronyms in Spanish) of the period 2009 to 2014, in Mexico [6]..

Material and methods

Study design, sample and population description

A cross-sectional and retrospective study was conducted, which was nested within from the national MIDE database (previously published), under a purpose and perspective of standard impact and management evaluation [6]. The primary sampling unit was six Family Medicine Clinics (FMC) from central-western region of Mexico City (Figure 1). The unit of analysis was the records of the six MIDE modules from all FMC included. The information unit was the database of these six FMCs from the SIMIDE database (Information System of the Comprehensive Diabetes Model by Stages, by its acronyms in Spanish Sistema de Información del Manejo Integral de la Diabetes por Etapas) from 2009 to 2014. A population sample (census) will be used.



Medic unit	Patients	Percentage
1.- F.M.C. "Azcapotzalco"	180	15.1
2.- F.M.C. "Cuitláhuac"	224	18.7
3.- F.M.C. "Legaría"	154	12.9
4.- F.M.C. "Marina Nacional"	325	27.2
5.- F.M.C. "Observatorio"	110	9.2
6.- F.M.C. "Revolución"	203	17.0

Figure 1: *Location of the family medicine clinics of the Regional Delegation of West Zone from the Security Institute and Workers' Social Services of the State. Source: Prepared by the authors using information from the national MIDE administrative database. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.*

Table 1: *Sociodemographic characteristics and basal conditions of laboratory tests of the study population.*

	Frequency; %, (95% CIa)
Sex	
Female	785; 65.6, (63-68.1)
Male	411; 34.4, (31.9-37)
Employment	
Self-employment	28; 2.34, (1.48-3.2)
Unemployment	9; 0.75, (0.26-1.24)
Employment	456; 38.13, (35.37-40.88)
Student	3; 0.25, (-0.03-0.53)
Housewife	443; 37.04, (34.3-39.78)
Retired	218; 18.23, (16.04-20.42)
Pensioner	35; 2.93, (1.97-3.88)
No Referred	4; 0.33, (0.01-0.66)
Civil status	
Married	795; 66.5, (63.8-69.3)
Divorced	37; 3.1, (2.2-4.1)
Single	172; 14.4, (12.5-16.3)
Free Union	46; 3.8, (2.8-5)
Widower	146; 12.2, (10.5-14.1)
Scholarship	
Illiterate	49; 4.1, (3.1-5.3)
Primary	317; 26.5, (24-28.8)
High school	310; 25.9, (23.5-28.3)
Technical	122; 10.2, (8.5-12)
Vocational	173; 14.5, (12.4-16.6)
Professional	202; 16.9, (14.8-19)
Postgraduate	20; 1.7, (1-2.4)
Other	3; 0.3, (0-0.6)
	Mean (standard deviation)
Age (n=1195)	59.18, (11.29)
Age of onset diabetes diagnosis (n=1196)	48.48, (12.24)
Blood glucose (n=1196)	243.35, (110.17)
Weight (n=1171)	72.99, (15.64)
Size (n=1171)	1.57, (0.29)
BMI (n=1171)	29.77, (9.21)
Abdominal circumference (n=1171)	95.78, (13.78)
Pelvic circumference (n=1171)	100.28, (14.24)
BUN (n=640)	22.41, (70.71)
Creatinine (n=779)	1.13, (2.627)
Creatinine clearance (n=83)	150.56, (536.14)
Glycated Haemoglobin (n=638)	8.49, (2.28)
Total cholesterol (n=758)	200.14, (58.61)
Triglycerides (n=768)	215.25, (149.65)
HDL cholesterol (n=86)	65.5, (59.86)
LDL cholesterol (n=17)	92.76, (64.06)

Source: Prepared by the authors using information from the national MIDE administrative database. a 95% CI= 95% confidence interval. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.

Table 2: *Family medical history of the study population a. Source: Prepared by the authors using information from the national MIDE administrative database. a Frequency; %, (95% CI). 95% CI= 95% confidence interval. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.*

	Diabetes[a]	Hypertension[a]	Myocardial infraction[a]	Cerebrovascular disease[a]	Obesity[a]	Lithiasis[a]
Parents with						
Both of them	231, 19.3; (17.1-21.7)	93, 7.8; (6.2-9.5)	9, 0.8; (0.3-1.3)	3, 0.3; (0-0.6)	96, 8; (6.4-9.6)	10, 0.8; (0.3-1.4)
Mother	355, 29.7; (27.3-32.2)	272, 22.7; (20.2-25)	62, 5.2; (3.9-6.5)	49, 4.1; (3-5.4)	123, 10.3; (8.5-12.2)	60, 5; (3.8-6.4)
Father	164, 13.7; (11.7-15.6)	104, 8.7; (7.1-10.4)	100, 8.4; (6.8-9.9)	43, 3.6; (2.5-4.8)	66, 5.5; (4.3-6.9)	22, 1.8; (1.2-2.6)
None	446, 37.3; (34.5-40)	727, 60.8; (57.9-63.6)	1025, 85.7; (83.8-87.7)	1101, 92.1; (90.4-93.5)	911, 76.2; (73.8-78.5)	1104, 92.3; (90.7-93.8)
No. of siblings with						
0	400, 43.7; (40.4-46.9)	426, 66.3; (62.5-69.8)	278, 84; (80.1-87.6)	231, 90.6; (86.7-94.1)	314, 53.9; (49.9-58)	225, 72.8; (67.6-78)
1	228, 24.9; (22.2-27.9)	111, 17.3; (14.3-20.2)	36, 10.9; (7.9-14.2)	23, 9; (5.5-12.9)	134, 23; (19.7-26.4)	71, 23; (18.1-27.8)
2	150, 16.4; (14.1-18.9)	64, 10; (7.8-12.3)	13, 3.9; (2.1-6)	1, 0.4; (0-1.6)	57, 9.8; (7.4-12.2)	12, 3.9; (1.9-6.1)
3	54, 5.9; (4.5-7.5)	22, 3.4; (2.2-5)	3, 0.9; (0-2.1)	-	38, 6.5; (4.6-8.7)	1, 0.3; (0-1)
4	41, 4.5; (3.2-5.9)	13, 2; (1.1-3.1)	1, 0.3; (0-1.2)	-	17, 2.9; (1.7-4.3)	-
5	24, 2.6; (1.6-3.7)	4, 0.6; (0.2-1.2)	-	-	12, 2.1; (0.9-3.3)	-
6	6, 0.7; (0.2-1.3)	1, 0.2; (0-0.5)	-	-	3, 0.5; (0-1.2)	-
7	6, 0.7; (0.2-1.2)	1, 0.2; (0-0.5)	-	-	1, 0.2; (0-0.5)	-
8	1, 0.1; (0-0.3)	1, 0.2; (0-0.5)	-	-	4, 0.7; (0.2-1.5)	-
9	4, 0.4; (0.1-0.9)	-	-	-	-	-
10	1, 0.1; (0-0.3)	-	-	-	1, 0.2; (0-0.7)	-
11	-	-	-	-	1, 0.2; (0-0.7)	-
13	-	-	-	-	1, 0.2; (0-0.5)	-
No. of children with						
0	824, 91.9; (90.1-93.5)	604, 94.8; (93.1-96.5)	327, 99.4; (98.5-100)	249, 97.6; (95.7-99.2)	440, 76.9; (73.3-80.2)	276, 89.6; (86-92.9)
1	53, 5.9; (4.5-7.5)	28, 4.4; (2.8-6)	2, 0.6; (0-1.5)	6, 2.4; (0.8-4.3)	90, 15.7; (12.8-18.9)	31, 10.1; (6.8-13.3)
2	15, 1.7; (1-2.6)	3, 0.5; (0-1.1)	-	-	28, 4.9; (3.1-6.6)	1, 0.3; (0-1)
3	3, 0.3; (0-0.8)	1, 0.2; (0-0.5)	-	-	7, 1.2; (0.3-2.3)	-
4	1, 0.1; (0-0.3)	-	-	-	3, 0.5; (0-1.2)	-
5	-	-	-	-	1, 0.2; (0-0.5)	-
9	1, 0.1; (0-0.3)	1, 0.2; (0-0.5)	-	-	-	-

Outcome and study variables

Technical efficiency was measured through the relationship between the products and services provided. Therefore, in this study the following outcome indicators will be considered: clinical assessment, laboratory tests and referrals to the specialist physician. The database contains data on age, diagnosis age of diabetes, sex, place of birth, employment, marital status, scholarship, medical unit, hereditary family medical history on diabetes, hypertension, myocardial infraction, cerebrovascular diseases, obesity, and lithiasis, personal medical history of diabetes, amputations, retinopathy, blindness, uraemia symptoms, smoking and alcohol consumption, physical examination, diabetes knowledge and nutrition, physical activity and education program. Baseline data was compared with post-program results for glucose control.

Statistical analysis

The results of the data analysis were expressed as absolute and relative frequencies (with their corresponding 95% confidence intervals (CIs)) and compared using Yates' chi-square test. The percentages of the reductions for the metabolic indicators were compared using one-way analysis of variance (ANOVA). The

Table 3: *Personal medical history of the study population. Source: Prepared by the authors using information from the national MIDE administrative database. aFrequency; %, (95% CI). 95% CI= 95% confidence interval. bPatients at the beginning of the program [Glycated hemoglobin (HbA1c) ≥ 7%]. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.*

	Yes[a]	No[a]	No referred[a]
Amputations	158; 13.2, (11.4-15.3)	1038; 86.8, (84.7-88.6)	-
Smoking	155; 13, (11-14.9)	1041; 87, (85.1-89)	-
Alcohol consumption	88; 7.4, (5.9-8.9)	1108; 92.6, (91.1-94.1)	-
Glucosuria	327; 27.3, (24.8-29.8)	40; 3.3, (2.3-4.3)	829; 69.3, (66.6-71.9)
Ketonuria	49; 4.1, (3-5.2)	68; 5.7, (4.4-7)	1079; 90.2, (88.6-91.9)
Microalbuminuria	56; 4.7, (3.6-5.9)	55; 4.6, (3.4-5.9)	1085; 90.7, (89-92.3)
Albuminuria	28; 2.3, (1.5-3.2)	60; 5, (3.8-6.3)	1108; 92.6, (91.2-94.1)
b Glycaemic uncontrolled patients	1116; 93.3, (91.9-94.7)	80; 6.7, (5.3-8.1)	-
b Uncontrolled patients by HbA1c criteria	500; 78.4, (75.2-81.3)	138; 21.6, (18.7-24.8)	-

means were compared using Tamhane's post-hoc test. Glucose levels were compared by each patient after and at the beginning to the program with Student's t test for related samples. A probability value <0.05 was considered statistically significant.

Ethical considerations

This study was conducted in accordance with good clinical practices, as defined by Mexican law, and the Helsinki Declaration for research using human beings. The study protocol was approved by a research ethics review committee and by a research review committee from ISSSTE. Identifier numbers were used to guarantee the anonymity of the patients.

Results

Baseline characteristics of the study population

It was included a total population of 1196 patients of outpatient consultation, predominantly females, people mainly born in Mexico City, employees, married people, and people with elementary school (Table 1). The average age of the patients in the present study was 59, and their average age of onset of diabetes was 48. The average of basal levels of anthropometrics measures and laboratory are shown in Table 1.

In relation to the hereditarily antecedents for t2D, hypertension, cerebrovascular disease, obesity and lithiasis, it was observed a higher proportion of mothers with these diseases, while, a higher proportion of fathers with a history of myocardial infarction was observed, as well (Table 2). Moreover, about 9% or more patients have at least a brother or sister suffering from these diseases, and 4% or more of the patients have offspring with t2D, hypertension, obesity, or lithiasis (Table 2).

In the other hand, the most frequent personal medical history was glucosuria followed by amputations, smoking, and alcohol consumption (Table 3). According to ocular disorders, 17 patients have a blindness history (Both eyes=3; 0.3%, 95% CI 0-0.6, right eye=8; 0.7%, 95% CI 0.3-1.2, and left eye=6; 0.5%, 95% CI 0.2-0.9), 37 have non-proliferative retinopathy (Both eyes=28; 2.3%, 95% CI 1.6-3.2, right eye=3; 0.3%, 95% CI 0-0.6, and left eye=6; 0.5%, 95% CI 0.2-0.9) and 18 have proliferative retinopathy (Both eyes=14; 1.2%, 95% CI 0.6-1.8, right eye=1; 0.1%, 95% CI 0-0.3, and left eye=3; 0.3%, 95% CI 0-0.6). Similarly, the most recurrent symptoms of uraemia were asthenia, and adynamia (6; 0.5%, 95% CI 0.2-0.9), pruritus (5; 0.4%, 95% CI 0.1-0.8), and nocturia (4; 0.3%, 95% CI 0.1-0.7), but the lowest frequent symptoms were paraesthesia (2; 0.2%, 95% CI 0-0.4), anorexia, nausea, and vomiting (1; 0.1%, 95% CI 0-0.3), and dyspnoea (1; 0.1%, 95% CI 0-0.3). In contrast to the reports of the physical examination, the majority of patients showed they had a physiological presence of both, the foot and tibial pulse, and present a patellar reflex, and an absence of pallor of the lower limbs, as well. However, a considerable percentage of patients have a decrease of the superficial and deep sensitivity (Table 4).

One of the characteristics of the MIDE program is that patients can be aware of the evaluation about their disease. As shown in Table 5, most patients are aware of their disease, its consequences, and its treatment. Although, 35.4% of the patients reported to have a glucose meter, and the most reported frequency of capillary glucose measurement was sporadic. Most of the patients started a diet plan for their disease (1180; 98.7%, 95% CI 96.8-100), as well as a physical activity plan (1,124; 94%, 95% CI 92.6-95.3), and a diabetes education program (1,156; 96.7%, 95% CI 95.7-97.7).

Analysing of technical efficacy

When analysing the technical efficacy using registration of information as a process indicator, it could be observed that for the next variables: age, age of onset of diagnosis, basal glucose level and last glucose level, the percentage of registration is 100%, whereas, for the rest of the variables there is a lack of registration from 2 to 99% (Table 6). In relation to the process of admission to the program, patients must meet one of two criteria: pre-prandial blood glucose >130 mg/dL or <70 mg/dL, or postprandial glucose >180 mg / dL; or HbA1c >7%. However, after analysing the pre-prandial glucose concentrations of each patient, it was observed that 6.7% of the patients were in glycaemic control (Table 3). Similarly, it was observed that, of the total of 638 patients (whom a laboratory test was), 21.6% were in metabolic control (Table 3). Subsequently analysing both indicators, we observed that 14 patients entered the program with glucose and Hb1Ac concentrations in metabolic control.

When the patients meet the criteria for a favourable response to the integrated treatment, they continue their follow-up in the same medical unit (with their family physician or their general physician), and they visit the MIDE module every six months to review their metabolic control [6].

Table 4: *Basal physical exploration of the study population. Source: Prepared by the authors using information from the national MIDE administrative database. a 95% CI= 95% confidence interval. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.*

	Frequency; %, (95% CIa)
Pale lower limbs	
Both of them	12; 1, (0.5-1.6)
Right	3; 0.3, (0-0.6)
Left	6; 0.5, (0.2-0.9)
None	1175; 98.2, (97.5-98.9)
Presence of the foot pulse in lower left limb	
Not referred	42; 3.5, (2.5-4.7)
Diminished	51; 4.3, (3.3-5.4)
Present	1103; 92.2, (90.6-93.6)
Presence of the foot pulse in lower right limb	
Not referred	41; 3.4, (2.4-4.5)
Diminished	49; 4.1, (3-5.3)
Present	1106; 92.5, (90.9-93.9)
Presence of the tibial pulse in left lower limb	
Not referred	49; 4.1, (3-5.2)
Diminished	42; 3.5, (2.5-4.6)
Present	1105; 92.4, (90.8-93.9)
Presence of the tibial pulse right lower limb	
Not referred	50; 4.2, (3.1-5.4)
Diminished	42; 3.5, (2.5-4.7)
Present	1104; 92.3, (90.8-93.9)
Patellar reflex	
Not referred	36; 3, (2.1-3.9)
Diminished	61; 5.1, (3.9-6.4)
Present	1099; 91.9, (90.2-93.4)
Surface sensitivity	
Not referred	32; 2.7, (1.8-3.6)
Diminished	167; 14, (12.3-16.1)
Present	997; 83.4, (81.2-85.3)
Deep sensitivity	
Not referred	43; 3.6, (2.6-4.7)
Diminished	177; 14.8, (12.9-16.8)
Present	976; 81.6, (79.4-83.7)

Table 5: *Background related to the knowledge of patients about their disease, its consequences and its treatment. Source: Prepared by the authors using information from the national MIDE administrative database. a 95% CI= 95% confidence interval. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.*

Do you know what diabetes is?	**Frequency; percentage, (95% CI[a])**
No	392; 32.8, (30.1-35.5)
Yes	804; 67.2, (64.5-69.9)
Do you know consequences of diabetes?	
No	472; 39.5, (36.9-42.1)
Yes	724; 60.5, (57.9-63.1)
Do you know the treatment of diabetes?	
No	554; 46.3, (43.6-49)
Yes	642; 53.7, (51-56.4)
Do you have a capillary glucose meter?	
Not referred	773; 64.6, (62-67.6)
Accu-Chek Active	66; 5.5, (4.3-6.9)
Accu-Chek Sensor	39; 3.3, (2.3-4.3)
Contour	13; 1.1, (0.5-1.7)
One Touch Ultra	38; 3.2, (2.2-4.3)
One Touch Ultra2	17; 1.4, (0.8-2.2)
Optium	30; 2.5, (1.7-3.3)
Other	220; 18.4, (16.3-20.7)
What is the frequency of measurement of your capillary glucose?	
Not referred	771; 64.5, (61.7-67.3)
Annual	6; 0.5, (0.2-0.9)
Daily	54; 4.5, (3.3-5.7)
Sporadic	182; 15.2, (13.3-17.3)
Monthly	30; 2.5, (1.7-3.5)
Weekly	153; 12.8, (10.9-14.9)

A patient is considered to have a positive response to integrated treatment if she or he has reached an acceptable level of empowerment and presents optimal control, in at least two determinations of HbA1c <7% (each determination with an apart of three months) [6].

Patients with sustained lack of control and / or with detected complications are referred to the second level of medical care [6].

According to the follow-up and referral criteria, patients may have a maximum of 3 consultations a year, however, they can visit the MIDE module before if necessary, and the physician may referral the patients to the second level of care if necessary. We observed that one percent of the population has more than 10 outpatients' consultations and more than 50% have between four and nine outpatients' consultations (Table 6). Regarding the last glucose concentrations reported per patient (n=1196; mean=138.97, (SD 56.74), it was observed an average concentration of glucose was lower compared to those glucose level at the beginning of the program (n=1196; mean=243.35, (SD 110.17). In contrast, we observed a difference between the initial average and the final glucose levels, in absolute terms, of 11.49 mg/dL (SD 72.97) and an average difference percentage of -1.63, (SD 49.31). Concerning glycaemic control, we could observe that at least 50% of the patients (683; 57.1%, 95% CI 54.2-59.6) controlled their glucose levels (the percentage of controlled patients increased from 6.7 to 57.1%). Furthermore, on average, patients significantly reduced their pre-prandial glucose levels by almost 12 mg/dL (t=5.45, p-value <0.01). Finally, when comparing the patient's average

Table 6: *Technical efficacy of the registration of information as process indicator.Source: Prepared by the authors using information from the national MIDE administrative database. a 95% CI= 95% confidence interval. BMI= body mass index. BUN= blood urea nitrogen. HDL= high density lipoprotein. LDL= low density lipoprotein. MIDE: Manejo Integral de la Diabetes por Etapas, a primary health care program for diabetes patients at the Security Institute and Workers' Social Services of the State (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE) family medical clinics nationwide.*

Variables	Frequency; percentage, (95% CI[a])
Age	1195; 100, (100-100)
Age of onset diabetes diagnosis	1196; 100, (100-100)
Basal blood glucose	1196; 100, (100-100)
Weight	1171; 98, (97-99)
Size	1171; 98, (97-99)
BMI	1171; 98, (97-99)
Abdominal circumference	1171; 98, (97-99)
Pelvic circumference	1171; 98, (97-99)
Blood glucose at the first subsequent visit	1047; 88, (86-89)
BUN	640; 54, (51-56)
Creatinine	779; 65, (62-68)
Creatinine clearance	83; 7, (5-8)
Glycated Haemoglobin	638; 53, (51-56)
Total cholesterol	758; 63, (61-66)
Triglycerides	768; 64, (61-67)
HDL cholesterol	86; 7, (6-9)
LDL cholesterol	17; 1, (1-2)
Last fasting blood glucose	1196; 100, (100-100)
Number of outpatient consultations reported per patient	
2	331; 27.7, (25.3-30.1)
3	243; 20.3, (18.1-22.6)
4	208; 17.4, (15.2-19.5)
5	254; 21.2, (18.8-23.6)
6	53; 4.4, (3.3-5.6)
7	49; 4.1, (3-5.3)
8	25; 2.1, (1.3-2.9)
9	21; 1.8, (1.1-2.7)
10	6; 0.5, (0.2-0.9)
11	5; 0.4, (0.1-0.8)
14	1; 0.1, (0-0.3)

values based on the number of outpatient's consultations, no significant differences were observed. Therefore, we do not observe data that suggest a greater number of outpatient's consultations greater glycaemic control (all p values calculating with Tamhane's post-hoc test is >0.05).

Discussion and conclusion

Access barriers to health care continue distancing us from the global health goal. Programs addressed to patients living with diabetes that incorporate multidisciplinary patient-centered care along their empowerment regarding to their disease and management have shown better metabolic control, diabetes knowledge, medication adherence, improved self-care behaviour's, motivation, capacity to take control of their disease, control of body weight, and quality of life [6-21]. This study showed that a model based on a co-responsibility component increases the scope of preventive services in primary health care in the metabolic control of patients living with t2D [8,22]. This model (unlike other models) was built based on three pillars: the person empowerment, the of health personnel training, and the health system strengthening [8,22]. The patient education program included empowerment topics such as promoting self-care through motivation and setting goals and achievements [6,8]. It encouraged the active patient participation by promoting decision-making in order to ensure the support in the disease control and prevention and its complications [6, 8]. It consolidated and expanded social networks, emphasizing the efficient incorporation of self-care in patients and their families [6,8]. The training program for health personnel educates

physicians under the concept of effective collaboration [7,8]. This view generated a mentality change about health professionals and allowed them to be trained as behaviours facilitators to promote active patient participation which is the backbone of health care and thus recognize the patient as the cornerstone and training purpose [7,8]. the health system strengthening lies in reducing the inappropriate use of available resources at the second and third care level and improving the resolution capacity of the first level of care units [8]. A multidisciplinary health team was integrated [6,8]. This professional team included physicians, nurses, social workers, nutritionists, dentists, psychologists and physical activators, who were trained to improve the effectiveness and quality of the preventive and curative care service [6,8]. Medications, medical equipment and supplies were provided [6,8], to monitor indicators such as glucose, lipids, and albumin through capillary tests in medical offices (which were attached to the usual laboratory and cabinet studies) [6, 8]. Outpatient consultation time was extended [6,8]. An electronic system was created to record information for the exclusive use of the model [6,8]. Regarding metabolic control and patient-centered education program, the results observed are similar to several studies that suggest a better HbA1c control in patients who attended an education program [18-21,23-26]. Overall, this care model allows improving the performance and capacity of first level care units to provide services that respond to the citizens 'needs because it incorporates more elements that other studies and its major aim is the patient-centered approach [18,23-25,27]. In this sense, public health institutions must implement patient-centered quality management systems, the identification of risks and the continuous improvement of the services provided to the population [28]. By combining several processes, the MIDE program provides an effective public health model for addressing chronic diseases and a new paradigm that can be applied and adapted in other settings.

The limitations of the study include the lack of analysis on the influence of factors associated with access to social security services, the social and cultural mechanisms that can affect the medical care process, the presence of health inequity, the influence of social determinants of health and the lack of variables related to barriers and facilitators of access to health care. The MIDE program strengths include: the involvement of many different actors and tools to support education programs for both patients and healthcare personnel, and the patient-centered approach to diabetes management, that includes tools to motivate changes in patients' behaviours and involving their families and social networks. Moreover, the current study opened a new hypothesis and questions about the actual influence of existing nutritional programs and the possibility to incorporate new programs based-on the patient´s empowerment. This study raises several questions about the control of variables such as the educational intervention sessions, dietary preferences, shared decision making, the counselling approach, the number of necessary educational sessions to impact in reducing patients' weight. Empowerment refers to the ability of a person to develop and acquire cognitive behavioural tools that allow he or she to change their lifestyle to display the ability to live on behaviours that promote health, using their environment resources. Therefore, what type of information enables patients to make an informed choice on their diet election? what kind of variables can bias the decision-making process? what is the influence of family and environment in the dietary preference of patients? The patient empowerment could influence the develop of new models of primary health care to develop the prevention strategies? How the medication adjustment affects weight loss? How the medication interacts with diet for control of weight loss and other variables? In summary, the present study allows us to observe that there are more issues that need to be taken into consideration health public systems for nutritional programs and the clinical practice guidelines. More studies like this are needed to answer more questions. In addition, now we are faced with the empowerment processes for patients using information and communication technologies [29]. Mainly for the vulnerable population of infection by SARS-Cov-2, 60-year-old patients or older living with diabetes, hypertension or obesity.

In conclusion, our study provides evidence that shows that the installation of integrated medical services specially designed for primary health care system, is important for a successful implementation; providing educational activities for healthcare staff and an t program empowerment for patients and their families, which is a perfect complement to the glycaemic control and the patient empowerment process. Among the points that are considered to be most important within a project of this nature, is the participation of multidisciplinary health care teams to improve the indicators of technical and process effectiveness, which impact on the patients´ metabolic control. Therefore, the MIDE program provides an effective public health model to manage chronic diseases. More importantly, it is an appropriate model to generate the structural changes required in public health institutions, which can be associated with an increase in health coverage by the first care level, because the model can be used in other chronic diseases care. Obtaining optimal results would require to standardize the managerial and clinical processes of the model to benefit a greater percentage of the population.

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