Research Article

Factors Influencing Glycemic Control in Patients with Diabetes Type II in Mexican Patients

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Abstract

Background: The glycemic control in patients with type 2 diabetes (T2D) is complex and difficult, due to the impact of multiple factors especially family members.

Aim: So the purpose of this study is to know the primary factors that influence glycemic control in patients with T2D.

Design and Setting: Comparative cross-sectional study.

Methods: In 166 patients with T2D in a family medicine unit in Ciudad Obregon, Sonora, Mexico, two groups where formed, the controlledgroup (with a fasting plasma glucose < 130 mg/dL and HbA1c < 7%) and the uncontrolled group (with a fasting plasma glucose ≥ 130 mg/dL and HbA1c ≥ 7%), surveys were conducted in obtaining socio-demographic (age, gender, marital status, schooling, socioeconomic status), clinical (body mass index, nutritional status, timeof diagnosis, use of insulin,number of medications used, history of high blood pressure, treatment adherence and patient physician relation) and family information (typology based upon integration, development, demographics; functionality and family life cycle stage).

Results: Patients in the uncontrolled group presented greater timeof diagnosis, lack of adherence to treatment, use of insulin, a non-satisfactory patient-physician relation, family dysfunction and find themselves prior to the retirement and death phase of the family life cycle.

Conclusion: In the treatment of patients with T2D, it is necessary to consider family and contextual variables to favora better control.

Keywords: Type 2 Diabetes Mellitus; Glycemic control

Introduction

The family, the nucleus of society, is the main resource of health promotion and disease prevention, as well as the most effective protection that feels and perceives the individual to all changes and contingencies throughout its vital cycle [1]. The family is the first network of social support that the individual possesses, and exerts protective function to the tensions generated in every day the life [2].

Understanding the life cycle and classifying the families of patients with diabetes is an important step to understand the crises and difficulties which the family is going through and how it influences on the glycemic control [3]. The family typology and its functionality are important aspects to consider in a family with patient carrier of T2D; the significance of these classifications is identified mainly in the need of the family physician to identify characteristics of the members of the families that influence the health-disease process, each of the classifications of typology and family functionality affects this process and conditions risk and protective factors for patients with chronic disease [4].

The main goal in the treatment of the patient with diabetes mellitus is to maintain an appropriate metabolic control, normalizing fasting plasma glucose (FPG) and glycosylated hemoglobin (HbA1c) levels to prevent, delay or minimize the development of the late-onset complications [5]. To achieve adequate glycemic control involves a series of factors that have not been studied in depth, which include biological characteristics, socio-economic and familial factors, therefore, it is important to determine the clinical and family factors associated with an adequate glycemic control in patients with T2D.

Methods

A comparative cross-sectional study was carried out, in the family medicine unit #1, of the Mexican Institute of Social Security, located in Obregon City, Sonora, Mexico; in patients with T2D, which were selected by a consecutive sampling techniques; that met the following inclusion criteria: age between 20 to 79 years, that accepted and signed the informed consent, in the company of an adult family member, which they lived with; patients with psychiatric illness and chronic renal failure were not included and eliminated those who did not complete the survey.

The following data were obtained directly from the patients: age, gender, marital status, educational stages, socioeconomic level, adherence to treatment, time from onset of T2D (considered the approximate date of diagnosis), insulin use, number of medications used (to determine the existence of polypharmacy, which was considered when the patient consumed 4 or more medications prescribed or not), and history of high blood pressure. The Graffar-

Méndez-Castellanos method was used to classify the socio-economic level [6], it was developed in France by Dr. Graffar and adapted by Dr. Hernán Méndez Castellanos, which consists of a stratification of the population from the following five variables: profession of the head of the family, level of instruction of the parents, source of income and housing and neighborhood aspect. From the sum of the variables five strata are identified: high level (stratum I), medium-high level (stratum II), medium level (stratum III), labor (stratum IV) and marginal level (stratum V). The instrument is validated to Spanish with a Cronbach´s alpha of 0.706.

Adherence to treatment was determined by the Morinsky Green test [7], which consists of fourclear and simple questions. This test considers good adhesion to that person who correctly answers the 4 questions made (no, no, no, no). It has 49% sensitivity and 68% specificity; it's validated in Spanish with a Cronbach´s alpha of 0.617. Doctor-patient relationship was measured by applying the PDRQ-9 questionnaire, consisting of 9 questions with a 5-point Likert-type scale, where: 1= very inappropriate and 5= very appropriate, it´s validated in Spanish with a Cronbach´salpha of 0.95. It is considered a successful physician-patient relationship with a score of 35 and above [8].

The participants long with the family companion were asked about the characteristics of the family based on development, demography, occupation of head of family, kinship and physical presence at home, livelihood, complications of development and conformation (De la Revilla L., the second consensus of Guadalajara in 2008 and currently accepted by the Mexican Council for certification in family medicine [4].

To evaluate family functionality the family Apgar score was used, which was created by Dr. Smilkstein in 1978. It´s a questionnaire that consists of five questions, with three answer options ranging from 0-2 points, validated in Spanish with a Cronbach´s alpha of 0.8010. The vital cycle was based on Geyman´s life cycle, developed by this same author in 1980 [9].

To determine nutritional status, body mass index (BMI) was calculated for which the patients were weighed and measured, on a scale with stadiometer (Transcell technology model TI-540-SL), it was calculated based on the Quetelet index (BMI = weight/talla^2).

Glycosylated hemoglobin (HbA1c) and fasting plasma glucose were taken from a sample of venous blood with a fast for at least 8 hours (AU-480 chemistry system), we considered controlled values those who had a plasma glucose fasting (GPA) < 130 mg/dl and HbA1c < % 7.

The data obtained was integrated into data collection sheets and analyzed using the SPSS program version 20 in Spanish, where we applied descriptive statistics for qualitative variables use frequencies and percentages and for quantitative variables mean, median, mode and standard deviation were used. The patients were divided into two groups, controlled and non-controlled considering HbA1c levels. It was considered a p< 0.05, with a 95% confidence interval.

The Protocol was authorized by the Local Committee of Research and Ethics in Health Research from the Family Medicine Unit #1, where the study took place.

Results

We analyzed a sample of 166 patients, of whom 86(51.8%) were women and 80(48.2%) men. The average age was 60.10±10. 59 (28-79) years, the time of diagnosis of the patients was on average 9.18± 6.2 (1-25) years. 146(88%) were married, 65.7% with primary schooling and 59.9% with a worker typesocio-economic level.

Out of the 166 patients, 100(60.2%) suffered from hypertension; 148 (89.2%) consume 4 prescription drugs or more; 88(53%) have proper adherence to treatment, 69(41.6%) use insulin, and 159(95.8%) referred to have a satisfactory patient physician relation.

With respect to glycemic control 72(43.4%) were in adequate control against 94 (56.6%) who weren't; fasting plasma glucose averaged was 169. 22±75.3 (68-375) mg/dl and HbA1c of 8. 06±2. 29 (4.8-13.10) %. The BMI was an average of 32.10±6.2 (21.9-50.4) kg/m^2.; 96 (57.8%) of patients had obesity, 55(33.1%) were overweight and only 15(9%) were within normal parameters.

Family functionality (APGAR test) presented a median of 8 points (±1.4). Out of a total of 132 families (79.5%) were functional and 34(20.5%) were dysfunctional. We found the following family characteristics: 163(98.2%) were classified have traditional, 164(98.8%) lived in urban areas, 146(88%) were of working-class; 162(97.6%) had a nuclear conformation, 164(98.8%) were integrated families and 119(71.7%) were classified in the retirement and death phase (Geyman).

Groups were classified according to glycemic control and they were statistically significant differences in time of diagnosis 7.54 ± 5.4 (controlled) against 10.4 ± 6.46 (uncontrolled) years (p=0.001), and in the gender variable, women had greater glycemic control 45(62.5%) compared to the men 27(37.5%) p=0.002. The glycemic controlled group showed a smaller proportion of insulin use 12(16.7%) against 57(60.6%) in the glycemic uncontrolled group (p=0.0001), as well as a better attachment to treatment 62(86.1%) vs 26(27.7%) (Controlled vs uncontrolled, p=0. 0001) (Table 1).

With respect to family characteristics, the glycemic controlled group showed that the majority of patients corresponded to the retirement and death phase (Geyman) 64(88.9%) against 55(58.5%) p=0.0001; and had a proper family functionality 69(95.8%) against 63(67.02%) of patients with some type of family dysfunctionality (p=0.0001, OR=11.31 95%CI [2.52-24.86]) (Table 2) [10].

Discussion

Summary

In our research study, we found that the majority of patients were women (51.8%) and were between the sixth and eighth decade of life, the population showed an average time of diagnosis of 9.18± 6.2(1-25) years and 62.1% of patients had more than 5 years diagnosed with T2D, the adherence to treatment was present in 69(41.6%); Out of the166 patients, only 69(41.6%) used insulin, in the glycemic controlled group there was a smaller proportion of use of insulin 12(16.7%) against 57(60.6%).

The patient physician relation was satisfactory in 159(95.8%) patients when analyzing the total of patients with unsatisfactory relation (7), 85.71% (6) had uncontrolled glycemic levels and only 14.29% (1) in control glycemic.

Table 1: Socio demographic and clinical characteristics.

		Controlled group (HbA1≤ 7%) n=72 (43.4%)				Uncontrolled group (HbA1≥ 7.1%) n=94 (56.6%)				p (X^2)
		μ	SD (±)	n	%	μ	SD (±)	n	%	
Age	Years	64.8	7.85			56.4	11.2			0.072*
Fasting plasma glucose	mg/dL	114.2	27.18			211.3	75.2			0.001*
HbA1c	%	5.9	0.58			9.7	1.6			0.001*
Time of diagnosis	Years	7.54	5.4			10.4	6.46			0.002*
Gender	Women			45	62.5			35	37.2	0.001
	Men			27	37.5			59	62.8	
Marital status	Married			60	83.3			86	91.5	0.269
	Civil union			1	1.4			1	1.1	
	Widowed			11	15.3			7	7.4	
Schooling	Illiterate			5	6.9			14	14.9	0.230
	Elementary			54	75			55	58.5	
	Junior High			9	12.5			21	22.3	
	High school			2	2.8			4	4.3	
	Pos graduate			2	2.8			0	0	
Socioeconomic status	Marginal			2	2.8			4	4.3	0.056
	Labor			19	26.4			29	30.9	
	Medium			41	56.9			53	56.4	
	Medium-high			10	13.9			8	8.5	
Body Mass Index (BMI)	Kg/m^2	31.5	6.15			32.5	6.3			0.355*
Nutritional status	Normal weight			9	12.5			6	6.4	0.042
	Overweight			26	36.1			29	30.9	
	Obese			37	51.1			59	62.8	
High blood pressure	Yes			47	65.3			53	56.4	0.246
	No			25	34.7			41	43.6	
Control hypertension	Yes			51	45.9			60	54.1	0.423
	No			21	38.1			34	61.8	
Insulin use	Yes			12	16.7			57	60.6	0.001
	No			60	83.3			37	39.4	
Treatment adherence	Yes			62	86.1			26	27.7	0.001
	No			10	13.9			68	72.3	
Number of prescribed medications	N	6.82	2.3			7.17	2.4			0.355*
Polypharmacy	Yes (with 4 or more medications)			66	91.7			82	87.2	0.363
	No (3 or less medications)			6	18.3			12	12.8	

Source: Data sheet. μ: mean, SD (±): standard deviation, n: number, %: percentage, *Student´s t, X^2: Chi square.

Regarding family functionality,132 families (79.5%) were considered functional and 34(20.5%) were considered dysfunctional families; when compared by their glycemic control, 69(95.8%) of patients in the controlled group had a proper functionality, while 63(67.02%) had a proper functionality in the uncontrolled group, this difference was statistically significant; The results of this study reveal that during the retirement and death phase 64(88.9%) of controlled patients and 55(58.5%) of patients with uncontrolled glycemic levels, based on their conformation, more frequently belonged to the nuclear family with 162(97.6%) patients.

Strengths and limitations

The present study demonstrates that the problem with T2D is not only structural, or accessibility to health services and family integration; but that it´s due to family dynamics, phase of the family life cycle, patient-physician relation and in aspects related to adherence to treatment.

There are no studies found evaluating all types of families presented in this study, no typology presented statistically significant differences in glycemic control, by what may be considered starting point for future comparisons.

Table 2: Family characteristics.

Family typology based upon:		Controlled group (HbA1≤ 7%) n=72 (43.4%)		Uncontrolled group (HbA1≥ 7.1%) n=94 (56.6%)		p (X²)
		n	%	n	%	
Development	Modern	2	2.8	1	1.1	0.411
	Traditional	70	97.2	93	98.9	
Demographics	Rural	1	1.4	1	1.1	0.849
	Urban	71	98.6	93	98.9	
Conformation	Nuclear	71	98.6	91	96.8	0.164
	Consanguineous	0	0	3	3.2	
	Without family	1	1.4	0	0	
Integration	Integrated	71	98.6	93	98.9	0.849
	Disintegrated	1	1.4	1	1.1	
Livelihoods	Agriculture	5	6.9	6	6.4	0.623
	Industrial	30	41.6	46	48.9	
	Commercial	8	11.1	13	13.8	
	Services	29	40.2	29	30.9	
Kinship	Nuclear	66	91.7	61	64.9	0.236
	Simple nuclear	5	6.9	29	30.9	
	Numerous Nuclear	0	0	1	1.1	
	Monoparental	1	1.4	0	0	
	Extended Monoparental	0	0	1	1.1	
	Extensive	0	0	2	2.1	
Family vital cycle phase	Expansion	0	0	6	6.4	0.001
	Dispersion	0	0	5	5.3	
	Independence	8	11.1	28	29.8	
	Retirement and death	64	88.9	55	58.5	
Family functionality	Functional	69	95.8	63	67.02	0.001
	Mild dysfunction	3	4.16	31	32.97	
	Moderate dysfunction	0	0	0	0	
	Severe dysfunction	0	0	0	0	

Source: Data sheet. µ: mean, n: number, %: percentage, *Student´s t, X²: Chi square.

Comparison with existing literature

In our research study, we found that the majority of patients were women (51.8%) and were between the sixth and eighth decade of life, which is similar to that reported by ENSANUT (2012) having the highest prevalence of T2D in this genre and age ranges [11].

The population showed an average time of diagnosis of 9.18± 6.2 (1-25) years and 62.1% of patients had more than 5 years diagnosed with T2D, which is similar to that reported by Méndez López et al., where 60% of its population had more than five years of evolution with T2D [12], this shows that it is a disease with high prevalence and because of its chronicity increases the risk of complications. According to our results, patients that have a greater time of diagnosis entails greater slippage, this difference was statistically significant and is contrary to what was reported by Rubio-Carranco A., which reported that in a sample of 1076 patients there is improvement in glycemic control whilst the disease continues its course [13].

Adherence to treatment was present in 69(41.6%) cases, which coincides with what was reported by the World Health Organization, that in developing countries like Mexico, adherence to treatment is below 50% [14], lack of adherence to treatment has short-term consequences in patients with T2D, especially in glycemic control, highlighting that only 26(27.7%) of patients with uncontrolled glycemic levels have adherence to treatment, against a 62(86.1%) who have an adequate control and adherence to treatment.

Out of the166 patients, only 69(41.6%) used insulin, in the glycemic controlled group there was a smaller proportion of use of insulin 12(16.7%) against 57(60.6%), similar to the reported findings by Alba LH et al. in a study conducted in Colombia where they found that in a sample of 150 patients, 54% used insulin and of them the 71.6% had bad glycemic control, these results were statistically significative [15], the results are also consistent with the presented by Rubio Carranco A. which reported that a sample of 1076 patients, 29.5% were under treatment with insulin and only half of those patients didn´t have good glycemic control [13]. These results

are contrary to expectations, since insulin is the ideal treatment for patients with diabetes, considering the insulin use and adherence to treatment variables; only 12(13.63%) patients out of 88 presenting attachment to treatment used insulin, compared to 57(73.07%) of the 78 who do not have adherence to treatment, this can be explained for several reasons, ranging from knowledge of the patient, the guidance provided by the medical staff and the route of administration.

The patient physician relation was satisfactory in 159(95.8%) patients, which shows a good communication and empathy between the physician and their patients, similar to that reported by Martín-Fernández et al., using the same questionnaire in 451 patients of a family medicine clinic in Madrid, Spain, obtained rates close to 90% of satisfaction [8]. Group analysis also showed that 98.81% (71) of the patients with good glycemic control had satisfactory patient physician relation, against 93.61% (88) of the group with lack of control this result is higher than that reported by Ríos-Álvarez M et al., who conducted a study in which they associated the patient physician relation and glycemic control in which concluded that 75% have a satisfactory relation [16].

When analyzing the total of patients with unsatisfactory relation (7), 85.71% (6) had uncontrolled glycemic levels and only 14.29% (1) who, despite assessing as having an unsatisfactory patient- physician relation, maintained good glycemic levels, thus reflecting the importance of the relation in the evolution of the disease.

This study shows that in our context there exists a higher perception of satisfaction compare to other studies, as presented by Ríos-Álvarez M et al. who found that only 2.4% of patients had an unsatisfactory patient- physician relation [16], while the study showed a percentage of 4.2% (7).

Regarding family functionality, 132 families (79.5%) were considered functional and 34(20.5%) were considered dysfunctional families; when compared by their glycemic control, 69 (95.8%) of patients in the controlled group had a proper functionality, while 63(67.02%) had a proper functionality in the uncontrolled group, this difference was statistically significant; the result in this variable is greater than that reported by Méndez-López et al. in a study conducted in 2004 on Ciudad Madero, Tamaulipas, where they sought to determine association between family functionality and glycemic control in patients with T2D, they found that 80% of the controlled patients had family functionality and 56% of the uncontrolled patients had adequate family functionality [12].

To contrast the family dysfunction in both groups, we found that in the controlled glycemic group dysfunction was present in 3(4.16%) patients, compared to the uncontrolled group where family dysfunction was found in 31(32.9%) patients, this shows that family dysfunction could be a factor for an inadequate control, without forgetting that family characteristics of each region of the country as well as changes in family dynamics and family types could also play a major role.

Understanding the family life cycle and type of family of patients with diabetes is an important step to understanding the crises and difficulties which the family is going through and how this is influencing glycemic control, we found that 119(71.7%) patients were in the retirement and death phase, which shows that the majority of patients with T2D have already crossed all the stages and crisis of the family life cycle which translates into the acquisition of more tools and experience to deal with adversity and therefore a greater likelihood of being in adequate glycemic control.

Results

Our result of the family life cycle is similar to the one reported by Saucedo-Martinez MG et al., who sought out association between lifestyle and family life cycle, finding that the family life cycle phase where more patients with T2D corresponded to the retirement and death phase, with 21% [3]. The results of this study reveal that during the retirement and death phase 64(88.9%) of controlled patients and 55(58.5%) of patients with uncontrolled glycemic levels, being statistically significant and exceeding Saucedo Martinez MG et al.

We also determined that the family typology, based on their conformation, more frequently belonged to the nuclear family with 162(97.6%) patients, without obtaining statistically significant differences between the two groups, this is similar to what was reported by Alba LH et al., in a study conducted in Colombia where they found that in a sample of 150 patients, 79% were of the nuclear family type based on their conformation and of these, 48% was controlled without obtaining results statistically significant [15].

Implications for Research and/or Practice

It is necessary to consider that the emotional aspect and adequate or inadequate coexistence with family influences behavior, interest or motivation to make a patient with T2D feel the need and desire to have a better control of their disease. One must understand diabetes mellitus treatment is complex and must be addressed from all individual and environmental factors, since access to health services and the availability of the drug do not guarantee adequate control [12].

The family environment is a key aspect that needs to be addressed by the treating physician of the patient as part of intervention for control of T2D, evident in this study, because of the higher proportion of family dysfunction in the non-controlled group compared to the controlled group.

Future comprehensive interventions involving patient with T2D within family and social dynamics are required, to be able to influence positively the key factors for the evolution of the disease, regardless of other interventions such as the promotion of health, treatment and prevention of complications.

How This Fits in

They are known clinical factors influencing glycemic control; however the influence of social and family variables not considered in the care of a patient with diabetes, this study highlights the importance of taking into account the comprehensive management of patients with diabetes.

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