

DIABETES KNOWLEDGE IN PREDOMINANTLY LATINO PATIENTS AND FAMILY CAREGIVERS IN AN URBAN EMERGENCY DEPARTMENT

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Purpose: To describe the baseline level of disease-specific knowledge in predominantly Latino patients with diabetes and in their family caregivers at an urban emergency department, and to elucidate characteristics which are associated with increased diabetes knowledge.

Methods: The 24-item Diabetes Knowledge Questionnaire (DKQ) was administered to a convenience sample of 291 primarily Latino adults in the emergency department who either had diabetes or who identified themselves as a caregiver for an immediate family member with diabetes. Participants with diabetes provided additional information on specific characteristics hypothesized to be associated with level of diabetes knowledge.

Results: Patients with diabetes received higher scores on the DKQ than their family caregivers (13.9 vs 12.3, $P < .01$). On univariate analysis self-monitoring of blood glucose, English language preference, longer time since diagnosis, and education at the high school level or above were associated with higher scores. However, on multivariate analysis only years since diagnosis and education reached statistical significance. The most frequently missed questions involved diet, signs of high/low blood sugar, organ function, and wound care.

Conclusions: Diabetes-specific knowledge was poor in both patients and primary family caregivers in our largely Latino urban emergency department patient population, highlighting the need for increased education in non-traditional settings. Based on our findings, this education should focus on areas of severe knowledge deficit including diet, symptoms of hyper- and hypoglycemia, and wound care. This study provides the foundation and justification for constructing effective and focused emergency department-based educational materials, thereby improving the knowledge and health of our patients. (*Ethn Dis.* 2011;21:1–6)

Key Words: Diabetes, Disease-specific Knowledge, Caregivers, Familism, Emergency Department

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INTRODUCTION

Good nutrition, regular exercise, and consistent medication regimens have all been shown to improve control of blood glucose in patients with diabetes.^{1–3} Patients with excellent knowledge and understanding of diabetes are able to adhere to these principles of self-care and have documented improved health outcomes.^{4,5} Gaining diabetes knowledge, however, may be difficult for patients who lack insurance and are unable to access primary care providers. These patients are often forced to use emergency departments (EDs) for both acute and chronic components of their diabetes management. These ED visits may represent a unique teachable moment for patients that are very difficult to reach. In order to optimize this teachable moment, we must first understand their baseline knowledge and identify specific knowledge deficiencies.

Latinos make up approximately 13% of the US population, yet account for 33% of the uninsured, thus making them more likely to rely on an ED for care.⁶ Moreover, Latinos are twice as likely as non-Latino Whites to develop diabetes and are 50% more likely than non-Latino Whites to die from it.^{7,8} The Centers for Disease Control and

Prevention has further shown that Latinos are significantly more likely to develop retinopathy, nephropathy, and peripheral vascular disease in addition to having poorer control of their blood pressure.⁹ Many factors for this discrepancy have been cited, including genetic predisposition, decreased access to care and cultural influence.¹⁰

Cultural influence is of paramount importance in Latino families as the management of the health of an individual is commonly a family affair.¹¹ Although not exclusive to Latinos, this concept is often called “familism.” Thus, to convert the ED visit into a successful teachable moment, we must also understand the characteristics and knowledge of primary family caregivers. In this study, we aimed to identify the baseline knowledge of the ED’s predominately Latino population with diabetes and of the caregivers of these patients using the previously validated Diabetes Knowledge

In this study, we aimed to identify the baseline knowledge of the emergency department’s predominately Latino population with diabetes and of the caregivers of these patients using the previously validated Diabetes Knowledge Questionnaire (DKQ).¹²

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Questionnaire (DKQ).¹² In addition, we tested several established independent variables associated with knowledge to determine which patient characteristics would indicate the most needy subgroup on which to focus future educational efforts.^{13,14}

MATERIALS AND METHODS

Setting

This was a prospective study of subjects enrolled from the ED at Los Angeles County Hospital at the University of Southern California (LAC+USC). The LAC+USC Medical Center is a public hospital located in East Los Angeles, and is one of the largest and busiest EDs in the United States with over 170,000 annual patient visits. The majority of patients treated in this ED are underserved, uninsured and from Spanish-speaking countries across Central and South America. The patients at the LAC+USC Medical Center tend to have limited access to primary care providers, have lower socioeconomic status and limited social resources.¹⁵

Participants

We enrolled a convenience sample of participants from ED triage between the hours of 9 am and 5 pm from July 2007 to September 2007. A bilingual research assistant screened adult patients presenting to ED triage with any chief complaint during this time period. Patients were considered to be eligible for enrollment in the study if they had an established diagnosis of diabetes (more than 3 months), or if they did not have diabetes but were a caregiver for an immediate family member with diabetes (parent, child, spouse). Participants were also required to be able to complete the survey in either English or Spanish. Generally, patients completed a written survey but, if necessary, the survey was read to them. Participants were excluded if they were unable to provide verbal informed consent, or if

they were medically unstable. This study was approved by the Institutional Review Board at our institution.

Data Collection

All those enrolled completed the DKQ, and provided us with basic demographic information including age, race, sex and language preference. Participants who were caregivers were asked to tell us which immediate family member with diabetes they provided care for. Patients with diabetes completed a second short survey containing independent variables previously shown to correlate with diabetes knowledge including: marital status, length of time since diagnosis of diabetes, highest level of education completed, current diabetes treatment regimen, if they perform self-monitoring of blood glucose (SMBG), and whether or not they have seen a primary care physician in the past year and/or have been admitted to the hospital for a diabetes-related illness in the last year.

Diabetes Knowledge Questionnaire

The DKQ is a 24-item test developed by the Starr County, Texas, Diabetes Education Study and is a shortened version of the original 60-item survey from Villagomez et al.¹⁶ Possible answers to each question are: yes, no, and I don't know. The items were scored with one point given for a correct answer and zero points given for an incorrect answer or an I don't know response. The questions from the 24-item test are written at the 6th grade reading level and are developed from recommendations from the National Standards for Diabetes Patient Education Programs. The Starr County study showed that the 24-item DKQ had good internal consistency and construct validity.¹² We determined a priori that if a particular question was missed by more than 75% of our subjects, the concepts conveyed in this question were in need of special attention.

Statistical Analysis

Data from paper surveys was transcribed into Excel (Microsoft Corp, Richmond, Wash) and analyzed using Stata 11.0 (Statacorp, College Station, Tex). Tests of significance were performed using Chi-square for categorical variables and Student's *t* test for continuous variables. A multivariate linear regression was conducted with number of questions correct as the dependent variable. The predictor and control variables were determined a priori according to the authors' theoretical model and prior work done in predicting disease specific knowledge, not through automated statistical procedures. Data are displayed with 95% confidence limits.

RESULTS

Demographics

We approached 302 eligible participants over the 3-month enrollment period, and 291 of these agreed to participate. Of the 291 participants, 142 were patients with diabetes and 149 identified themselves as caregivers of immediate family members with diabetes. The mean age of participants was 47.3 (range 18–76) and they were 54.7% female. Fifty-eight percent of those who completed the surveys were Spanish speaking and the other 42% were English speaking. The participants were predominately Hispanic (79.9%), but also included Asians (3.8%), Blacks (8.0%), and Caucasians (7.7%) (Table 1).

Markers of Diabetes Knowledge

The mean DKQ score (out of a possible 24) for patients with diabetes ($n=142$) was 13.9 (95% CI 13.2–14.5) and for family caregivers ($n=149$) was 12.3 (95% CI 11.8–12.9). On univariate analysis, SMBG, English language, higher education, and years since diagnosis of diabetes were each associated with significantly higher DKQ scores.

Table 1. Demographics of LAC+USC emergency department sample

Characteristic	Total	Patients with DM	Family members
Age in years, mean \pm SD	47.3 \pm 13.2	52.1 \pm 10.9	42.6 \pm 13.6
Female	54.7%	52.8%	56.5%
Ethnicity			
Hispanic, <i>n</i> or %	231 (79.9%)	73.9%	85.0%
White, <i>n</i> or %	22 (7.6%)	9.8%	5.4%
Black, <i>n</i> or %	23 (8.0%)	9.2%	6.8%
Asian, <i>n</i> or %	11 (3.8%)	4.9%	2.7%
Spanish Language	58.5%	57.0%	59.9%
Relation to patient with DM	N/A	N/A	1) parent (78.9%) 2) child (4.1%) 3) husband (9.5%) 4) wife (4.1%)

DM – diabetes mellitus

Univariate analysis for variables thought to be associated with variable DKQ scores are shown in Table 2. On multivariate linear regression, only number of years since diagnosis and education remained significantly associated with increased DKQ scores. Each additional year since diagnosis was associated with a .13 (95% CI 0.04–0.22 $P=.01$) point increase in DKQ score while high school education increased score by 2.61 (95% CI 0.1.0–4.2; $P=0.001$) (Table 3). Marital status, type of treatment, and hospital admission or primary care visit within the last year were not found to be statistically significant on univariate or multivariate analyses. Six questions on the DKQ were answered incorrectly by greater than 75% of participants: questions 1, 3, 12, 17, 21, and 24 (Table 4).

DISCUSSION

Overall, both patients with diabetes and primary family caregivers demonstrated poor knowledge of diabetes as measured by the DKQ. Knowledge of diabetes is known to be an important part of a patient's self-management and improvement in overall health.^{4,5} This study indicates that longer duration since diagnosis, SMBG, English language preference and higher level of education were associated with in-

creased diabetes-specific knowledge in patients with diabetes. As educational resources are limited, future educational interventions should focus on patients who have a recent diagnosis of diabetes, those who do not speak English, those who have limited formal education, and those who do not perform SMBG.

Although prior studies showed marital status and type of treatment significantly affected DKQ scores, this was not the case in our subjects.¹³ We hypothesized that patients who had seen a healthcare provider in either the primary care or hospital setting within the last year would achieve higher DKQ scores as these are the two traditional locations in which education should occur. The data, however, showed no relation between DKQ scores and contact with a primary care or admitting physician in the last year. This argues for the development of efficient diabetes education in non-traditional settings such as the ED.

Familism is the concept that the responsibility of managing health may not fall on the shoulders of the individual with a disease, but rather on another member of the family such as a child or a spouse. Previous work has shown that familism is particularly strong in Latino cultures.¹¹ Based on this, we hypothesized that in our largely Latino sample, DKQ scores in family caregivers would be equal to or higher

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than in subjects with diabetes. However, we observed the converse; caregivers scored significantly worse than patients with diabetes (12.3 vs 13.9; $P<.01$). It is important to note that while participants with diabetes generally had better diabetes knowledge than family caregivers, averages for both groups was still below 60%.

Six questions on the DKQ posed a significant challenge for our participants; more than 75% of participants marked the incorrect answer on questions 1, 3, 12, 17, 21, and 24 (Table 4). Over 90% of participants lacked understanding of proper wound care, 75% were unaware of the connection between the overconsumption of sugar and the development of diabetes and more than 85% believed that a diabetic diet consists of special foods. Most alarmingly, approximately 85% of participants confused the signs of high and low blood sugar. If patients and/or caregivers do not have the ability to recognize the signs relating to a change in blood sugar, they may treat incorrectly or not at all in life-threatening glycemic states. In addition, patients will have considerable difficulties maintaining consistent control of their blood glucose levels and consequently, their general health may suffer.

The findings of our study are generally consistent with prior research. A recent study investigating diabetes knowledge in Kuwaiti adults at 24 diabetes clinics recorded a mean score of 58.9% on the Michigan Diabetes Knowledge Test. Similar to the findings in our study, Kuwaiti participants who had lower educational levels, shorter disease duration, and performed less

Table 2. Univariate analysis- Diabetes Knowledge Questionnaire (DKQ) vs patient characteristics

	<i>n</i>	DKQ Score‡	<i>P</i>
Marital status			
Married	59	13.7 (12.6–14.7)	.57
Not married	80	14.1 (13.1–15.0)	
Self monitoring blood glucose (SMBG)			
SMBG	82	14.7 (13.8–15.5)	<.01*
No SMBG	60	12.8 (11.7–13.8)	
Primary care access			
Has PMD	107	14.0 (13.2–14.8)	.58
No PMD	34	13.5 (12.1–15.0)	
Hospitalization			
Recently admitted	30	14.1 (12.6–15.6)	.73
No recent admission	112	13.8 (13.0–14.6)	
Language preference			
English	61	14.9 (13.8–16.0)	.01
Spanish	81	13.1 (12.2–14.0)	
Medical management			
Uses insulin	46	14.8 (13.5–16.0)	.08
Oral hypoglycemic	95	13.5 (12.7–14.3)	
Education			
Less than high school	61	12.5 (11.5–13.4)	<.01†
High school	47	15.3 (14.1–16.5)	
College	25	15.3 (13.7–16.8)	
Years since diabetes diagnosis			
>3 years		13.2 (11.8–14.5)	.03‡
3–7 years		12.8 (11.3–14.2)	
7–15 years		14.1 (12.8–15.5)	
>15 years		15.6 (14.3–16.8)	

* Student's *t* test

† One-way ANOVA

‡ mean score out of possible 24 (95% CI)

PMD, primary medical doctor

Table 3. Multivariate linear regression models showing independent variables associations with diabetes knowledge

Variable	Coefficient (95% CI)	<i>P</i>
College education*	2.1 (0.08–4.2)	.04
High school education*	2.61 (1.03–4.2)	<.01
Glucometer use	.92 (–.6–2.42)	.22
Years with DM*	.13 (.04–.22)	<.01
PMD visit within past year	.42 (–1.26–2.09)	.62
Hospital admission† within past year	–1.21 (–3.0–.62)	.19
Currently married	–.29 (–1.66–1.06)	.67
Insulin	.12 (–1.59–1.83)	.55
Spanish survey	–1.2 (–2.7–0.3)	.12

* Statistically significant predictors of level of diabetes knowledge

† for diabetes-related illness

DM, diabetes mellitus

PMD, primary medical doctor

glucose monitoring received lower scores on the questionnaire. Other variables associated with decreased knowledge included older age, limited family income, negative family history of diabetes, smoking, history of fewer complications, insulin usage, and decreased frequency of insulin injections.¹⁷ A study of Malaysian patients with diabetes demonstrated that knowledge deficits correlated with lower educational levels, older subjects, and oral anti-hyperglycemic medication use. Fifty-three percent of the participants who completed that study's 75-item questionnaire scored below 50%. The questionnaires were administered at the in- and out-patient departments of an urban general hospital, a district hospital, and two rural health care centers in Malaysia.¹⁸ Firestone et al performed a study of Costa Ricans with type 2 diabetes, using the Diabetes Knowledge Questionnaire to assess extent of diabetes-specific knowledge in patients located at suburban, urban, and hospital clinics. That study found that more years of education, younger age, longer diabetes duration, and home glucose monitoring were predictors of advanced diabetes knowledge.¹³ Importantly, none of the previously mentioned studies was conducted in an emergency department setting. It is interesting to note that mean scores of our urban ED patients on diabetes knowledge tests, were similar to mean scores of patients in other studies conducted in primary-care settings.

LIMITATIONS

Several limitations were noted throughout the course of this study. First, our population is unique in that a significant number of our patients are Latino, have decreased annual incomes, limited formal education, and increased barriers to accessing primary care. Therefore, the patients who come to the ED at LAC+USC are likely repre-

Table 4. DKQ-24 results for LAC+USC emergency department sample*

Item	Questions	Total	Patients with DM	Family members
1	Eating too much sugar and other sweet foods is a cause of diabetes.	25.6	24.6	26.5
2	The usual cause of diabetes is lack of effective insulin in the body.	64.7	69.0	60.5
3	Diabetes is caused by failure of the kidneys to keep sugar out of the urine.	24.6	23.9	25.1
4	Kidneys produce insulin.	35.6	38.0	33.3
5	In untreated diabetes, the amount of sugar in the blood usually increases.	81.3	83.1	79.6
6	If I am diabetic, my children have a higher chance of being diabetic.	82.0	82.4	81.6
7	Diabetes can be cured.	53.3	58.5	48.3
8	A fasting blood level of 210 is too high.	75.1	82.4	69.4
9	The best way to check my diabetes is by testing my urine.	50.2	59.9	40.8
10	Regular exercise will increase the need for insulin or other diabetic medication.	48.4	58.5	38.8
11	There are two main types of diabetes: type 1 (insulin-dependent) and type 2 (non-insulin dependent).	75.4	77.5	73.5
12	An insulin reaction is caused by too much food.	23.5	28.2	19.0
13	Medication is more important than diet and exercise to control diabetes.	47.4	43.0	51.7
14	Diabetes often causes poor circulation.	76.8	81.0	72.8
15	Cuts and abrasions on diabetics heal more slowly.	85.5	85.9	85.0
16	Diabetics should take extra care when cutting their toenails.	91.3	93.0	89.8
17	A person with diabetes should cleanse a cut with iodine and alcohol.	8.3	10.6	6.1
18	The way I prepare my food is as important as the foods I eat.	89.6	90.1	89.1
19	Diabetes can damage my kidneys.	87.9	93.0	82.3
20	Diabetes can cause loss of feeling in my hands, fingers, and feet.	81.7	86.6	76.9
21	Shaking and sweating are signs of high blood sugar.	15.2	21.8	8.8
22	Frequent urination and thirst are signs of low blood sugar.	32.5	38.7	26.5
23	Tight elastic hose or socks are not bad for diabetics.	40.1	45.8	34.7
24	A diabetic diet consists mostly of special foods.	12.8	12.7	12.9

* % answered correctly

sentative of those who need the most supplementary education. Although our unique population may restrict the overall external generalizability of this study, the findings may be significant for other urban EDs with similar demographics. Second, participants from the ED were obtained by a convenience sample, potentially introducing selection bias. This was unavoidable due to the high volume of patients

in our ED; screening and interviewing every patient with diabetes would have been logistically impossible. Third, the blood sugar levels and HbA_{1C} levels of those who completed the survey were not tested, leaving us uncertain if increased diabetes knowledge in our population correlates with better control of blood glucose or better overall health. Fourth, we did not match patients with their specific caregivers. Although it

would have been ideal to have information from a caregiver and a patient within the same family, this was logistically difficult as patients often came in alone. It is possible that if we had tested a patient and a caregiver from the same family, a patient with poor knowledge might have had a caregiver with better knowledge. In addition, this study did not distinguish between patients with type 1 and type 2 diabetes, a minor limitation in our setting since the vast majority of patients who seek care at our ED have type 2 diabetes. Finally, in the multivariate analysis, our failure to confirm statistical significance of associations between SMBG and language may have resulted from insufficient statistical power.

CONCLUSION

This study identified profound knowledge deficiencies among primarily Latino patients with diabetes and caregivers for patients with diabetes at an urban, safety-net ED. Years since diagnosis of diabetes and formal education were positively associated with diabetes knowledge, as were English language preference and SMBG on univariate analysis. Alarming, over 75% of patients and caregivers lacked knowledge of critical topics including wound care, signs of hypo- and hyperglycemia and appropriate diet. Educational materials or programs designed to help vulnerable urban ED populations should focus on the most needy patient subgroups and address the most common and profound knowledge gaps identified in our study.

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