Depression among diabetic women in urban centers in Mexico and the United States of America: a comparative study

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ABSTRACT

Objective. To compare the prevalence and patterns of depressive symptoms among women with type 2 diabetes in Puebla, Mexico, and Chicago, United States.

Methods. Two cross-sectional studies were conducted independently, in Puebla (September 2010–March 2011) and in Chicago (January–July 2010). Depression symptomatology was evaluated in a random sample of 241 women self-reporting type 2 diabetes in Puebla and a convenience sample of 121 women of Mexican descent seeking care for type 2 diabetes in Chicago. Depressive symptomatology was measured by the Center for Epidemiologic Studies Depression Scale administered in either English or Spanish. Women were similarly socioeconomically disadvantaged with low education levels in both locations.

Results. The Chicago sample of women reported higher levels of depression than the Puebla sample (38% versus 17%, P < 0.0001). Among those with comorbid depression and diabetes in both sites, minimal variations in symptoms were observed. Depressive symptoms, specifically the subjective element (feeling sad) and symptoms associated with diabetes (fatigue and sleep problems) were heightened in both groups. More frequent reporting of "feeling fearful" was statistically significant in Puebla.

Conclusions. Despite a higher prevalence of depression among Mexican immigrant women with diabetes in the United States compared to Mexico, there was little variation in their depressive symptoms, regardless of residence. However, women in Mexico did report a higher incidence of fear. Screening for depression in patients with diabetes should take into account symptoms of fatigue and sleep and the bi-directional relationship of depression and diabetes.

Key words   Depressive disorder; diabetes mellitus, type 2; sleep disorders; emigration and immigration; Mexico; United States.

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Diabetes mellitus, type 2, is a global problem that disproportionately affects low-income populations—80% of individuals with diabetes live in low- and middle-income countries (1). Mexico now has the highest obesity rate in the world and a diabetes prevalence of 15.9% (1). By contrast, the overall rate of type 2 diabetes in the United States is 9.3% (2); however, diabetes prevalence among Mexican-Americans, at 15.6%, mirrors that of Mexico (3). Moreover, depression has been identified as an important comorbidity for people with diabetes in both countries. Clinical studies suggest that comorbid depression among urban residents with diabetes in Mexico is 27%–48% (4, 5), while in the United States, it is 25% (6), with a somewhat higher rate of 32% for Mexican-Americans (7).

Multiple studies have documented a bi-directional relationship between depression and type 2 diabetes (8–11). While living with diabetes contributes to depression (12, 13), biological and behavioral pathways also link depression to diabetes via neurohormonal pathways, alterations in glucose transport, increased immunoinflammatory activation, and the use of antidepressants (8, 11). Depression among those with diabetes is associated with non-adherence to diabetes treatment (14–17), increased diabetes complications (18), and poor glycemic control (19). However, little is known about which depressive symptoms are common among people with diabetes and the symptoms may be linked to social versus diabetes issues.

The bi-directional comorbidity of depression and type 2 diabetes among the urban poor is a growing concern. In the United States, untreated depression among the poor has been associated with heightened diabetes-related morbidity and mortality (18, 19). This study's objective was to compare the prevalence and patterns of depressive symptoms reported by urban women with type 2 diabetes in Mexico (Puebla) and the United States (Chicago).

MATERIALS AND METHODS

Two studies were conducted independently: in Puebla, Mexico, from January–July 2010, and in Chicago, Illinois, United States, from January–July 2010. Both locations excluded patients with cognitive impairment, active substance abuse, or a degree of psychosis that might interfere with data collection. Each study's methods are outlined below.

Sample from Puebla, Mexico

This was an observational, cross-sectional study of women previously diagnosed with type 2 diabetes, recruited from any one of 24 outpatient, public clinics known as a "Family Medicine Unit" within the Instituto Mexicano del Seguro Social (Mexican Social Security Institute, Mexico City, Mexico). Potential participants were selected randomly from one shift per day, which was also randomly selected. Study participants were females 18–60 years of age, with diabetes duration of at least 12 months, and who verbally agreed to be interviewed. Participants who were unable to answer the questionnaire due to lack of Spanish-language competence were excluded. To form a sample comparable to that of Chicago, only female respondents 40 years of age or more were included in the analysis. In all, 267 women were evaluated; 22 were excluded for being less than 40 years of age, and 4 incomplete questionnaires were eliminated. The final Puebla sample was 241 women 40–60 years of age with diabetes.

All data collection was reviewed and approved by the Mexican Institute of Social Security's Institutional Review Board in Puebla, Mexico. Although not completed anonymously, questionnaires were physically and electronically protected and identifying data was concealed.

Sample from Chicago, Illinois, United States

This was a cross-sectional study of 121 first- and second-generation Mexican immigrant women seeking diabetes care at a public hospital in Chicago. A convenience sample was composed of female patients who self-identified as Mexican or Mexican-American, were 40–65 years of age, and could give written consent in either English or Spanish. Participants were interviewed for 2–6 hours regarding stressful life events, mental health, immigration, and diabetes. A more extensive discussion of the methods and findings have been published elsewhere (20). To reduce the impact that older age might have on predicting depression and to form a sample comparable to that of Puebla, 29 participants were excluded for being more than 60 years of age.

All data collection was reviewed and approved by Institutional Review Boards of John H. Stroger, Jr. Hospital of Cook County (Chicago, Illinois, United States) and Northwestern University (Evanston, Illinois, United States). Data was physically and electronically protected; questionnaires were completed anonymously.

Data collection and study instrument

The specific sociodemographics collected and analyzed for this study were: age, education (< 12 years or ≥ 12 years of schooling), geographic location (Puebla or Chicago), and birthplace (Mexico or the United States). Acculturation was assessed by years lived in the United States. Clinical data evaluated were diabetes control and duration and obesity. In Chicago, Hemoglobin A1c was used to evaluate glycemic control via finger-stick blood samples; in Puebla, it was determined by the mean of the three most recent fasting glucose measurements noted in the patient's medical record. In both locations, participants were informed of their depression-screening results and referred to a specialist as needed. They were also given a brochure on depression.

Center for Epidemiologic Studies Depression Scale (CES-D). Depression was measured in both Chicago and Puebla by administering the CES-D, a widely used 20-item questionnaire designed to assess the major symptoms of depression, in English (21) or in its validated Spanish translation (22).

The CES-D targets symptoms such as depressed mood, changes in appetite and sleep, low energy, feelings of hopelessness, low self-esteem, and loneliness. Respondents are asked to consider the presence and duration of each item/symptom over the past week and to rate each along a four-point scale from 0 (rarely or never) to 3 (most or all of the time). Possible scores range from 0–60. Data shown by the present study was for a cut-off score ≥ 23, recommended for depression screening among clinical populations (23).

Analyses

The primary objective of the analysis was to compare the prevalence of depression across study sites. First, demographic and clinical variables between Chicago and Puebla were compared using chi-square and Student's t-test (Table 1). Then, to identify the variables associated with depression in each site, we compared the demographic and clinical variables between patients with and without depression in Chicago and Puebla, separately, using chi-square and Student's t-test (Table 2). We also performed a logistic regression analysis to explore which variables were associated with depression, controlling for relevant demographic and clinical variables at each of the two sites (Table 3).

A secondary objective was to determine if depressive symptoms among women in Mexico were similar to those of Mexican immigrants in the United States (Table 4). For this analysis, we

TABLE 1. Comparison of demographic and clinical characteristics of women of Mexican descent with type 2 diabetes in Chicago, United States, 2010, and Puebla, Mexico, 2010–2011

Variable	Chicago (n = 92) No.[a]	Chicago (n = 92) %	Puebla (n = 241) No.[a]	Puebla (n = 241) %	Chi-square and Student's t test	P value
Demographics						
Age, in years (mean ± SD[b])	51.6 ± 7.58		52.51 ± 5.67		0.81	0.4182
More than 12 years of schooling	45	49	46	19.7	28.53	< 0.0001
Household income less than US$ 25 000	73	79	NA			
Ever married	79	86	220	91.7	2.496	0.1140
Spanish as primary language	48	52	100			
Birthplace (Mexico)	64	70	100			
Years in the United States for Mexican-born women (mean, ± SD)	29 ± 14.8		NA			
Diabetes measures						
Obesity (body mass index > 35)	43	47	102	42.3	0.528	0.467
Diabetes duration, in years (mean ± SD)	9.75 ± 8.06		10.13 ± 7.27		2.69	< 0.01
Uncontrolled diabetes[c]	72	78	123	53.9	16.3	< 0.0001
Depression measures						
Depression (CES-D[d] = 16+)	48	52	76	31.5	12.51	0.0005
Depression (CES-D = 23+)	35	38	42	17.4	15.91	< 0.0001

NA: not available.
[a] Unless otherwise specified.
[b] Standard deviation.
[c] For the Chicago sample, HbA1c ≥ 7.5; for the Puebla sample, mean of three most recent glycemia. measurements > 140.
[d] *Center for Epidemiologic Studies Depression Scale* (21, 22).

TABLE 2. Demographic and health outcomes among women previously diagnosed with type 2 diabetes in Chicago, United States, 2010, and Puebla, Mexico, 2010–2011

Variable	Total n	Depressed No.	Depressed %	Chi-square	P value
Puebla sample					
Education					
< 12 years	194	39	20	4.75	0.03
≥ 12 years	46	3	6.5		
Work					
Unemployed	141	26	18	0.2091	0.65
Employed	99	16	16		
Marriage					
Ever married	220	40	18	0.85	0.36
Never	20	2	10		
Glycemic control					
Controlled	105	17	16	0.42	0.51
Uncontrolled	123	24	19.5		
Obesity					
Normal Weight	139	21	15	1.228	0.27
Obesity	102	21	21		
Age (mean ±SD)	n	Mean	SD	T-value	P-value
Depression	42	53	5.54	0.61	0.54
No depression	199	52.4	5.73		
Chicago sample					
Education					
< 12 years	47	16	34	0.65	0.41
≥ 12 years	45	19	42		
Born in the United States	27	11	41	0.11	0.73
Born in Mexico	65	24	37		
Glycemic control					
Controlled	20	7	35	0.10	0.75
Uncontrolled	72	28	39		
Obesity					
Normal weight	49	19	39	0.02	0.88
Obesity	43	16	37		
Age (mean ±SD)	n	Mean	SD	T-value	P-value
Depression	35	54	5.7	2.56	0.01
No depression	57	50.7	6.3		

TABLE 3. Multivariable analysis of the relationship of demographic and clinical variables with depression among women with type 2 diabetes in Chicago, United States, 2010, and Puebla, Mexico, 2010–2011

Variable	Odds ratio	Wald confidence limits (95%)		P value
Group (Chicago)	3.7	1.8	7.49	< 0.001
Age	1.05	0.999	1.102	0.05
Obesity	1.38	0.801	2.397	0.24
More than 12 years of school	0.714	0.38	1.34	0.29
Diabetes duration, in years	1.019	0.983	1.057	0.31
Poorly controlled diabetes	1.279	0.63	2.57	0.49

TABLE 4. Patterns of depressive symptoms reported on the *Center for Epidemiologic Studies Depression Scale* (CES-D) as occurring "almost every day" by depressed women with type 2 diabetes in Chicago, United States, 2010, and Puebla, Mexico, 2010–2011

CES-D symptom items	Chicago (n = 35) %	Puebla (n = 42) %	P value[a]
1. I was bothered by things that usually don't bother me.	28.6	42.9	0.19
2. I did not feel like eating; my appetite was poor.	37.1	28.6	0.42
3. I felt that I could not shake off the blues even with help from my family or friends.	37.1	50.0	0.26
4. I felt I was just as good as other people.	17.1	11.9	0.51
5. I had trouble keeping my mind on what I was doing.	42.9	38.1	0.67
6. I felt depressed.	77.1	69.1	0.43
7. I felt that everything I did was an effort.	65.7	47.6	0.11
8. I felt hopeful about the future.	51.4	38.1	0.24
9. I thought my life had been a failure.	20.0	40.5	0.053
10. I felt fearful.	17.1	45.2	0.009
11. My sleep was restless.	65.7	50.0	0.16
12. I was happy.	45.7	42.9	0.80
13. I talked less than usual.	17.1	35.7	0.068
14. I felt lonely.	45.7	45.2	0.97
15. People were unfriendly.	14.3	26.2	0.20
16. I enjoyed life.	42.9	38.1	0.67
17. I had crying spells	37.1	45.2	0.47
18. I felt sad.	60.0	59.5	0.97
19. I felt that people dislike me.	25.7	21.4	0.66
20. I could not get "going."	48.6	45.2	0.77

[a] *P* values reflect the chi-square test that indicates whether or not each item is the same in both samples.

compared only women who were depressed in Chicago to depressed women in Puebla; responses to each item on the CES-D were dichotomized into two categories: "almost every day" and "not almost every day." The second category included "rarely or none of the time (less than 1 day)," "some or a little of the time (1–2 days)," and "occasionally or a moderate amount of time (3–4 days)." This dichotomy is consistent with the diagnostic criteria outlined by the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition, which states that symptoms should be present almost every day to meet criteria for depression. Table 4 presents a chi-square analysis of each item, and whether or not they were the same in the Chicago and Puebla samples.

RESULTS

Table 1 shows sociodemographic characteristics of the Chicago and Puebla samples, as well as the frequency of depression among the women in both groups. Among the women in Chicago, 38% met the criterion for depression, compared to only 17.5% of those in Puebla. While the sociodemographics of the two groups were similar, education levels differed: almost half of the women in Chicago had at least 12 years of schooling compared to only 20% of those in Puebla. Diabetes control also differed, with more uncontrolled diabetes in Chicago (78%) than in Puebla (53.9%).

Table 2 presents sociodemographics and depression results by study site,

including some variables disaggregated by Chicago as birthplace. The only variables significantly associated with depression were age and schooling, but not in the same sites. In Chicago, women with depression were significantly older than those without depression (54 ± 5.7 versus 50.66 ± 6.26, *P* = 0.01). In Puebla, women with fewer years of schooling were depressed more frequently than those with 12 or more years (20% versus 6.5%, *P* = 0.03).

Table 3 presents the logistic regression results. The dependent variable was depression; the independent variables, selected because they were the only two that showed significant differences between the two sites, were lack of diabetes control and years of schooling. This table demonstrates that the only variables that predicted depression were the group.

Table 4 addresses the study's secondary objective: identifying similarities and differences in the pattern of depressive symptoms reported by women in Chicago and Puebla. Table 4 shows that in both groups the following symptoms occurred most frequently: "I felt depressed," "I felt that everything I did was an effort," "My sleep was restless," and "I felt sad," demonstrating similar patterns in heightened depressive symptoms. Table 4 also shows that only "I felt fearful" (item 10) was significantly different between the women in Puebla and those in Chicago. By including item 10, plus "I thought my life had been a failure" (item 9; *P* = 0.053) and "I talked less than usual" (item 13; *P* = 0.06) in a logistic regression analysis, only "I felt fearful" maintained a significant difference between the two groups (Odds ratio [OR] = 3.259; 95% Confidence Interval [95%CI] = 1.065–9.973). These three symptoms appeared "almost every day" in the women from Puebla, more so than in Chicago. Regarding birthplace in the Chicago sample, there were no significant differences among women born in the United States versus those born in Mexico.

DISCUSSION

To the best of our knowledge, this transnational study is the first to examine differential patterns and symptoms of depression among women with type 2 diabetes in urban Mexico and the United States. We employed similar procedures and instruments at both sites, despite

the research being conducted by two teams of researchers. The data clearly indicate that depressive symptoms were much higher among the women with diabetes in Chicago (38%) than in Puebla (17%). However, among the depressed women, there was congruence in depressive symptomatology across study sites. We will discuss this major finding and its implications in turn.

First, nearly twice as many women in Chicago reported depression. This suggests that the mental health of women of Mexican descent residing in the United States with diabetes is worse than that of their counterparts in Mexico. Previous studies have shown that the longer immigrants live in the United States, the worse their health becomes (24); this tendency is apparent for both diabetes (2, 25, 26) and depression (27). However, for those with diabetes, our findings did not indicate a relationship between depression and time of residence in the United States. The lack of a relationship between depression and time of residency questions whether "acculturation" plays a role in these disparate findings, or if instead, other social and economic issues in urban centers in the United States are contributing. During the study interviews, the women in Chicago described other important social and economic factors that might influence depression—interpersonal abuse, poverty, and a breakdown of social support resulting from immigration (20).

Second, the only symptom that significantly differentiated the groups was "feeling fearful," reported most commonly by women residing in Mexico. This was an interesting finding because, while cultural background has been found to influence self-reported health status (28), cultural background was not a variant in this study; the only variance was immigration status. There is some evidence of fear playing a role in mental health, culminating in "fear-based behaviors" (29) and, specifically, a fear of being unable to pay for diabetes care (30). However, why the women in Mexico felt more fear than those in the United States is unclear. It has been shown that neighborhood violence has a direct and indirect impact on depression (31), and recently, that crime does mediate the relationship between disorder perceptions, self-rated health, and depression, though the mediating pathways are weak (32). Yet, since Chicago

has one of the highest homicide rates in the United States, it is unlikely that women living there would report lower levels of fear, but it could be that first generation immigrants who tend to reside in immigrant enclaves (24) feel less fearful.

Finally, frequent reporting of certain depressive symptoms among those with diabetes brings up some important questions. For example, is diabetes the cause of great duress, or are other (social) problems playing a role? Frequent reporting of depression-related symptoms might be pointing to factors such as those that emerged from an in-depth analysis of the life history narratives gathered during the interviews in Chicago (e.g., interpersonal abuse, feeling socially isolated, and immigration-related stress) (20).

In Mexico, social contributors to feeling fearful may contribute to depression. More mixed-methods research is needed to fully understand the social complexities around the bi-directional relationship of depression and diabetes.

Also, could targeted mental health screening improve diabetes care? Similarities in the frequency with which both the Chicago and Puebla women reported sleep problems and fatigue—DSM-IV criteria for depression and symptoms associated with diabetes (33, 34)—underscore the importance of mental health care for people with diabetes. A recent article indicated a bi-directional relationship between sleep problems and diabetes, where sleep problems may promote insulin resistance and diabetes itself may cause alterations in sleep (33). Moreover, like the CES-D, many depression inventories incorporate symptoms that overlap with diabetes (35). For instance, in the CES-D, item 7 ("I felt that everything I did was an effort") refers to fatigue, which is also a clinical symptom for both type 1 and 2 diabetes. "Feeling that everything is an effort" is also an item of the K6 screening scale (36), a non-specific psychological distress scale widely-used to screen for mental illness among patients with diabetes (37, 38). In addition, "feeling tired or having little energy" is included in the Patient Health Questionnaire (PHQ-9), a clinical inventory commonly used by diabetes researchers to identify depression (39, 40). Therefore, depression screening can provide clinicians with important diabetes-specific symptoms that could improve medical care.

Study limitations

A limitation of this research was that the samples were taken from separate studies conducted by two research teams at two distinct sites, i.e., there may be some lack of congruence between sociodemographic variables and methods for measuring diabetes control. Also, we did not examine the relative impact of the social and health care systems in each country, so what role Mexico's progressive public health system may have played in lower depression cannot be determined. In addition, cross-cultural comparisons of some sociodemographics may pose disparity; for example, with "years of education," the context may reflect different levels of competence in each location. Moreover, since a random sample was used in Puebla and a convenience sample in Chicago, it is not surprising that higher levels of depression were found in the latter. Also, since most of the Chicago sample had lived there for almost three decades, the results may be biased toward long-standing immigrants. While important to note these limitations, these study findings are relevant nonetheless, demonstrating a depression-symptom profile of patients with diabetes in both places.

Conclusions

This study provides evidence of increased mental distress among Mexican immigrant women with diabetes in Chicago over their counterparts in Puebla, Mexico. These findings also reveal that there is little variation in the depressive symptoms of women with comorbid diabetes and depression, regardless of residence. Across both groups, the women similarly reported the subjective element (feeling sad) and diabetes-related symptoms (fatigue and sleep problems).

Since fatigue and sleep problems may occur as a result of diabetes or as a result of a depressive disorder, causal inference is difficult. These study findings, however, provide some insight into factors surrounding the bi-directional relationship of depression and diabetes. Although more research is needed, screening for depression in patients with diabetes should take into account symptoms of fatigue and sleep and the bi-directional relationship of depression and diabetes.

Conflict of interests. None.

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RESUMEN

Depresión en mujeres diabéticas de los centros urbanos de México y los Estados Unidos: un estudio comparativo

Objetivo. Comparar la prevalencia y las características de los síntomas depresivos en mujeres aquejadas de diabetes tipo 2 en Puebla (México) y Chicago (Estados Unidos).

Métodos. Se llevaron a cabo independientemente dos estudios transversales, en Puebla (de septiembre del 2010 a marzo del 2011) y en Chicago (de enero a julio del 2010). Se evaluó la sintomatología depresiva en una muestra aleatoria de 241 mujeres con diagnóstico de diabetes de tipo 2 en Puebla, y en una muestra de conveniencia de 121 mujeres de ascendencia mexicana que acudieron en busca de atención de su diabetes de tipo 2 en Chicago. La sintomatología depresiva se midió mediante la Escala de Depresión del Centro de Estudios Epidemiológicos, administrada ya fuera en inglés o en español. En ambas ubicaciones, las mujeres pertenecían a niveles socioeconómicos desfavorecidos de forma similar y sus niveles de educación eran bajos.

Resultados. Se notificaron niveles más altos de depresión en la muestra de mujeres de Chicago que en la muestra de Puebla (38 frente a 17%, *P* < 0,0001). En ambos sitios, se observaron variaciones mínimas en los síntomas de las mujeres que padecían depresión y diabetes de manera concomitante. Los síntomas depresivos, específicamente el elemento subjetivo (sentirse triste) y los síntomas asociados con la diabetes (cansancio y problemas de sueño), aparecían intensificados en ambos grupos. La mayor frecuencia de la notificación de "sentirse temerosa" encontrada en Puebla fue estadísticamente significativa.

Conclusiones. A pesar de una mayor prevalencia de depresión en las mujeres mexicanas con diabetes inmigrantes en los Estados Unidos, en comparación con las que vivían en México, hubo poca variación en los síntomas depresivos, independientemente de la residencia. Sin embargo, las mujeres residentes en México notificaron una mayor incidencia de temor. El tamizaje de la depresión en pacientes con diabetes debe tener en cuenta los síntomas de cansancio y de trastornos del sueño, y la relación bidireccional entre la depresión y la diabetes.

Palabras clave Trastorno depresivo; diabetes mellitus tipo 2; trastornos del sueño; migración internacional; México; Estados Unidos.