Prevalence of Depression Among U.S. Adults With Diabetes

Findings from the 2006 Behavioral Risk Factor Surveillance System

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OBJECTIVE — To estimate the prevalence rate of depression among adults with diabetes using a large population-based sample in the U.S.

RESEARCH DESIGN AND METHODS — Data from the 2006 Behavioral Risk Factor Surveillance System, a standardized telephone survey among U.S. adults aged ≥18 years, were analyzed (n = 18,814). The Patient Health Questionnaire diagnostic algorithm was used to identify major depression.

RESULTS — The age-adjusted prevalence rate of major depression was 8.3% (95% CI 7.3–9.3), ranging from a low of 2.0% in Connecticut to a high of 28.8% in Alaska. There were 25-fold differences in the rate among racial/ethnic subgroups (lowest, 1.1% among Asians; highest, 27.8% among American Indians/Alaska Natives). People with type 2 diabetes who were currently using insulin had a higher rate than people with type 1 diabetes (P = 0.0009) and those with type 2 diabetes who were currently not using insulin (P = 0.01).

CONCLUSIONS — Major depression was highly prevalent among people with diabetes; the prevalence rate varied greatly by demographic characteristics and diabetes types.

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The prevalence rate of depression has varied tremendously by definition, study design, source of subjects, time frame, and measurement methods in previous studies (1–3); thus, it is difficult to accurately estimate the potential medical care needs and public health burdens of depression in the general diabetic population. Most of the self-administered questionnaires (1–4) cannot directly establish a diagnosis of depression. Standard interviews, such as the Structured Clinical Interview for DSM Disorders (SCID) (5) and the Composite International Diagnostic Interview (CIDI) (6), can yield a clinical diagnosis according to the Statistical Manual of Psychiatric Disorders, 4th edition (DSM-IV) (7); however, lengthy assessments and high costs preclude the extensive use of such structured diagnostic interviews in large population-based surveys.

In contrast, the Patient Health Questionnaire (PHQ) consists of the actual nine DSM-IV criteria for depressive disorders (7); it can establish provisional diagnoses of major and minor depression as well as evaluate the severity of depressive symptoms (8). The PHQ-9 diagnosis of major depression yielded acceptable sensitivity and specificity compared with independent diagnoses using the SCID (9,10). The PHQ-8, which omits the ninth item inquiring about "thoughts that you would be better off dead or of hurting yourself in some way," has a validity for major depression similar to that of the PHQ-9 (8). In this study, we estimated the prevalence rate of major depression measured by the PHQ-8 among adults with diabetes using a large population-based sample from the 2006 Behavioral Risk Factor Surveillance System (BRFSS) in the U.S.

RESEARCH DESIGN AND METHODS

— The BRFSS is a standardized telephone survey that assesses key behavioral risk factors and chronic conditions among adults aged ≥18 years in all U.S. states and territories annually. The median cooperation rate among states was 74.5% in 2006 (11). BRFSS data have consistently been found to provide valid and reliable estimates when compared with national household surveys (12,13).

Diabetes was ascertained by self-reports. People were classified as having type 1 diabetes if their age at diagnosis was <30 years and they were currently using insulin. People were classified as having type 2 diabetes if their age at diagnosis was ≥30 years or if their age at diagnosis was <30 years and they were currently not using insulin (14).

The PHQ-8 was implemented in 41 states and territories (11). Major depression was defined as having at least five of eight PHQ-8 criteria, one of which must be "depressed mood" or "loss of interest or pleasure," for ≥7 days in the past 2 weeks. Minor depression was defined as having two to four of the eight PHQ-8 criteria, one of which must be "depressed mood" or "loss of interest or pleasure," for ≥7 days in the past 2 weeks (7,8). Alternatively, a severity score of 0–3 was assigned to each item (0 = "0–1 day," 1 = "2–6 days," 2 = "7–11 days," and 3 = "12–14 days"), yielding a total score between 0 and 24 points. A PHQ score ≥10 has been recommended as a cutoff point for screening depression (8).

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Abbreviations: BRFSS, Behavioral Risk Factor Surveillance System; CIDI, Composite International Diagnostic Interview; SCID, Structured Clinical Interview for DSM Disorders; PHQ, Patient Health Questionnaire.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

Table 1—*Prevalence of depression as measured by the PHQ-8 among U.S. adults with diabetes aged ≥18 years (2006 BRFSS)*

		Provisional diagnosis							
		Major depression*		Minor depression†		Major and minor depression‡		PHQ score ≥10	
	n	%	SE	%	SE	%	SE	%	SE
Total									
Unadjusted	18,814	7.5	0.4	7.9	0.5	15.4	0.6	14.4	0.6
Age adjusted	18,814	8.3	0.5	8.3	0.8	16.6	0.9	17.4	1.1
Age (years)									
18–29	230	3.2	1.0	8.3	2.9	11.5	3.1	12.7	3.4
30–39	848	13.7	2.0	10.3	1.8	24.0	2.6	27.4	3.1
40–49	2,251	11.6	1.1	7.9	1.1	19.5	1.5	21.4	1.8
50–59	4,634	10.0	0.8	7.2	0.7	17.2	1.0	17.3	1.0
60–69	5,387	5.5	1.0	9.0	1.2	14.5	1.5	11.2	1.2
70–79	3,939	4.0	0.9	6.4	0.6	10.4	1.0	8.3	1.0
80+	1,525	2.0	0.7	7.7	1.9	9.7	2.0	5.8	1.0
Sex§									
Men	7,896	5.9	0.7	7.1	0.9	13.0	1.1	12.9	1.3
Women	10,918	11.1	0.8	9.7	1.3	20.8	1.5	22.4	1.6
Race/ethnicity§									
Non-Hispanic white	13,392	9.5	0.7	5.8	0.5	15.3	0.9	17.6	1.3
Non-Hispanic black	2,296	5.6	1.0	11.7	2.1	17.3	2.3	13.7	1.6
Hispanic	1,775	5.4	0.8	13.0	2.7	18.4	2.8	17.3	3.0
Asian	296	1.1	0.6	1.0	0.6	2.1	0.8	3.1	1.3
American Indians/Alaska Natives	392	27.8	4.7	5.4	1.7	33.2	4.6	36.0	4.9
Other‖	663	13.2	3.5	16.0	3.6	29.2	4.4	27.7	4.6
Type of diabetes§¶									
Type 1	810	6.3	1.1	7.7	1.3	14.0	1.7	20.4	2.8
Type 2, use of insulin	3,759	13.3	1.8	9.4	1.2	22.7	2.2	24.0	2.3
Type 2, no use of insulin	12,892	8.3	0.7	8.4	1.2	16.7	1.4	17.3	1.6

*Major depression is defined as having at least five of eight PHQ-8 criteria, one of which must be "depressed mood" or "loss of interest or pleasure," for ≥7 days in the past 2 weeks. †Minor depression is defined as having two to four of the eight PHQ-8 criteria, one of which must be "depressed mood" or "loss of interest or pleasure," for ≥7 days in the past 2 weeks. ‡Combining major and minor depression together. §Adjusted for age. ‖Including native Hawaiian or Pacific Islander, multiracial, and other race/ethnicity. ¶Participants with missing data on age at diabetes onset and use of insulin were excluded.

The prevalence rates of depression were estimated according to age, sex, race/ethnicity, and diabetes types. Student's *t* tests were used to compare the differences in the rates between subgroups. SUDAAN software (Release 9.0; Research Triangle Institute, Research Triangle Park, NC) was used to account for the complex sampling design.

RESULTS — Of the total 226,646 participants, 22,990 people reported having diabetes (8.2%). After excluding people with missing data, the analytic sample (n = 18,814) consisted of 42.0% men, 71.2% non-Hispanic whites, 12.2% non-Hispanic blacks, 9.4% Hispanics, 1.6% Asians, 2.1% American Indians/Alaska Natives, and 3.5% other ethnic groups, with a mean age of 62 years. The age-adjusted prevalence rate of major depression was 8.3%, ranging from a low of 2.0% in Connecticut to a high of 28.8% in Alaska.

The rate was low at ages 18–29 years, increased at ages 30–39 years, and decreased after age 40 years ($P < 0.05$ for linear trend; $P < 0.0001$ for quadratic trend) (Table 1). Women had a higher rate of major depression than men ($P < 0.0001$). Compared with non-Hispanic whites, non-Hispanic blacks ($P = 0.002$), Hispanics ($P = 0.0003$), and Asians ($P < 0.0001$) had a lower rate of major depression, while American Indians/Alaska Natives ($P = 0.0001$) had a higher rate. People with type 2 diabetes who were currently using insulin had a higher rate of major depression than people with type 1 diabetes ($P = 0.0009$) and those with type 2 diabetes who were currently not using insulin ($P = 0.01$). The rate of depression using PHQ score ≥10 appeared to be similar to the rate of combined major and minor depression using the provisional diagnosis.

CONCLUSIONS — Using a large population-based sample, we estimated that the age-adjusted prevalence rate of major depression was 8.3% among U.S. adults with diabetes in 2006. Previous studies have reported that the prevalence rates varied from 3.8 to 27.3% with an aggregate estimate of 9.0% by the standard interviews and from 11.5 to 60.7% with an aggregate estimate of 26.1% by the self-administered questionnaires (1). Our population-based rate was similar to the aggregate estimate of the standard interviews.

This study contributed unique findings to the literature by demonstrating ~25-fold differences in the rate of major depression among racial/ethnic subgroups and nearly 15-fold differences

among the 41 U.S. states and territories. Particularly, type 2 diabetic patients on insulin therapy were highly subject to major depression. Despite the benefits of insulin therapy (15), psychosocial and/or physiological barriers associated with insulin regimens (16), as well as disease severity (17), may increase the likelihood of major depression.

A methodological innovation of our study was the application of the PHQ-8 (8), which was developed for clinical use based on the DSM-IV criteria (7), in a large population-based sample. The close agreement between the prevalence estimate from our study using the PHQ-8 diagnostic algorithm for major depression and the pooled estimate from a meta-analysis of clinical studies (1) using standard interviews, such as SCID and CIDI, suggests that the PHQ-8 could be potentially useful as a brief and cost-effective self-administered diagnostic instrument to identify people with major depression in population-based surveys as well as in clinical practice (1,9,10). Indeed, our results indicate that a substantial number of people with diabetes are at an increased risk of having major depression, and those who care for patients with diabetes should routinely screen them for major depression using the PHQ-8 or other such instruments.

A limitation of our study is related to self-reported diabetes status. However, there has been a substantial agreement between self-report and medical records for diabetes (18). Despite this limitation, our study is the first to use the PHQ-8 to estimate the prevalence rate of major depression in the largest population-based sample thus far. Our results are useful in establishing a baseline rate for monitoring the future trends of major depression among adults with diabetes in the U.S.

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