Diabetes and psychiatric illness in the total population of Stockholm

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ABSTRACT

Objective: Concomitant psychiatric disorders in people with diabetes affect morbidity and mortality. We aimed to study psychiatric morbidity in people with diabetes and the general population using administrative health care data in Stockholm County.

Methods: The study population included all living persons who resided in Stockholm County, Sweden, on January 1, 2011 ($N = 2{,}058{,}408$). Subjects with a diagnosis of diabetes were identified with data from all consultations in primary health care, specialist outpatient care and inpatient care during the time span 2009–2013. As outcome, information was obtained on all consultations due to any psychiatric diagnosis as well as, specifically, schizophrenia, bipolar disorders, depression, and anxiety disorders, in 2011–2013. Analyses were performed by age group and gender. Age-adjusted odds ratios (ORs) with 95% confidence intervals (95% CI) for women and men with diabetes, using individuals without diabetes as referents, were calculated.

Results: Age-adjusted OR for all psychiatric diagnoses among people with diabetes was 1.296 (95% CI 1.267–1.326) for women and 1.399 (95% CI 1.368–1.432) for men. The greatest excess risk was found for schizophrenia, with OR 3.439 (95% CI 3.057–3.868) in women and 2.787 (95% CI 2.514–3.089) in men, with ORs between 1.276 (95% CI 1.227–1.327) and 1.714 (95% CI 1.540–1.905) for the remaining diagnoses.

Conclusion: The prevalence of psychiatric disorders is elevated in people with diabetes, which calls for preventive action to be taken to minimize suffering and costs to society.

Introduction

There are several links between somatic diseases and psychiatric disorders. Diabetes and depression may influence each other in different ways [1–3]. Insulin resistance has been shown to be associated with depression [4], and people with diabetes have a higher risk of comorbid depression [5–7]. Moreover, depression has been shown to be a risk factor for incident diabetes [6,8,9], and depression has also been linked to inflammation and increased oxidative stress [10,11]. Other psychiatric conditions have been shown to be commonly associated with diabetes, and to affect somatic health and outcomes among people with diabetes [12], including schizophrenia (partly drug induced) [13], bipolar disorder [14], generalized anxiety as well as panic disorders [15]. There are signs of a dysregulated immune system in many psychiatric disorders [16], and some antipsychotic drugs are associated with weight gain and disturbed glucose metabolism [17]. Besides, there are genetic links between diabetes and schizophrenia [18–20].

Somatic health among people with psychiatric disorders is not always given high priority [21]. For example, people with diabetes and depression [22], or anxiety [23], have been shown to have poorer metabolic control, and there is also an increased risk of hypoglycemia in people with both diabetes and depression [24]. People with both diabetes and depression have been shown to have an increased risk of both cardio-vascular and all-cause mortality [25–27]. Besides, mental health among people with diabetes does not always receive full attention. The quality of life among people with diabetes and concomitant mental disorders is shown to be substantially affected [28], and people with type 1 diabetes are at increased risk of suicide [29].

Many studies of psychiatric disorders in people with diabetes have been based on the registration of depressive symptoms or the use of antidepressant drugs [8]. Less is known about clinically diagnosed individuals in the community.

In Stockholm County, with a total population of more than two million people, all diagnosis codes and reasons for hospitalizations and consultations in primary health care and specialist care are recorded and stored in a large administrative database. This comprehensive data

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collection enables epidemiological research in a large unselected population cohort.

Electronic medical records and administrative databases enable studies on the prevalence and incidence of diseases [30–32], and the quality of the data has been shown to be high [33,34]. Yet, comorbidities have not been studied thoroughly in administrative databases covering diagnoses registered in primary care, specialist open care and in hospital care.

Based on the aforementioned studies, we hypothesized that mental health is poorer in people with diabetes than in the general population in Stockholm. Thus, the aim was to study the prevalence of concomitant psychiatric diagnoses among people with diabetes, in particular depression, bipolar disorders, anxiety, and schizophrenia, as compared to people without diabetes in all care forms in the total population of Stockholm County.

Methods and study population

Stockholm County today has over 2.1 million inhabitants, representing more than one-fifth of Sweden's entire population. The region includes the capital city of Stockholm and several other cities and towns, as well as large rural areas and a sparsely-populated archipelago. The Stockholm County Council is responsible for financing primary and secondary health care, mainly through taxes. With the exception of a very small number of private clinics that operate without subsidies in Stockholm, all consultations and diagnoses are recorded and stored in a central regional database at Stockholm County Council, the Stockholm Regional Health Care Data Warehouse (VårdAnalysdataLager, VAL). Besides consultations and diagnoses, VAL compiles and stores data on healthcare utilization from primary care, specialist open care, as well as in-hospital care [30,35]. As an indication of its accuracy and validity, VAL is used by the Council for updating the National Patient Register kept by the Swedish National Board of Health and Welfare (NBHW) as well as the annual benchmarking reports of the NBWH and the Swedish Association of Local Authorities and Regions [33].

Since 1997, diagnoses have been coded according to WHO's International Classification of Diseases, 10th edition (ICD-10).

Design

This is a cross-sectional study comparing people with a diabetes diagnosis with people without a diabetes diagnosis with regard to their psychiatric diagnoses. Diagnoses were obtained from electronic patient records, or were registered separately at discharge from hospital or after a consultation, and are thus clinically based.

Study population

The present study population included all living persons who resided in Stockholm County on January 1, 2011 ($N = 2,058,408$). Data on all healthcare consultations in primary care, specialized open care, and in-hospital care between 2009 and 2013 were extracted from VAL. People with at least one visit or one hospital stay where a diagnosis of diabetes was registered during 2009–2013 were identified. Similarly, psychiatric disorders found in the Stockholm population in 2011–2013 were identified.

Major diagnosis groups

The following ICD codes were used to define the patient groups: Diabetes mellitus E10–E14 for which we chose a diagnostic window of five years (2009–2013), in order to include a substantial number of patients with diabetes [30]. Any psychiatric diagnosis, i.e. mental and behavioral disorders (the full F-chapter in ICD-10), schizophrenia (F20), bipolar disorders also including mania (F30–F31), depression including depressive episodes, recurrent depressive disorder, persistent mood disorders (also including cyclothymia and dysthymia), and other or unspecified mood disorders (F32–F34, F38–F39), and anxiety disorders including all anxiety disorders and phobias (F40–F41) were chosen to find the psychiatric diagnoses. For the psychiatric diagnoses, we narrowed the diagnostic window to 2011–2013, in order to catch a large enough number of psychiatric diagnoses.

Ethics

All data we handled were anonymized and none of the individuals could be identified. Management and analysis based on the VAL database are part of a continuous quality control of healthcare utilization in Stockholm County Council, and ethical approval has been obtained from the regional ethical review board in Stockholm to study comorbidities with these data.

Statistical methods

Standard descriptive statistics such as numbers and percentages of the total population (N) were used. Logistic regression was used in the analyses to calculate the odds ratios (OR) with 95% confidence intervals if the people with diabetes mellitus had more or fewer psychiatric disorders than the rest of the population, controlling for age and presented for each sex separately. Statistical analysis and data management were performed using SAS software, version 9.3 (SAS Institute Inc., Cary, NC).

Results

The demography of Stockholm County with the number of men and women with or without diabetes in different age groups is shown in Table 1. The number and percentage of subjects in different age groups with psychiatric diseases, divided according to the presence or absence of diabetes, are presented in Table 2a for women and Table 2b for men. Compared to subjects without diabetes, people with diabetes were diagnosed with psychiatric diagnoses to a higher extent in almost all age groups, the main exceptions being women between 75 and 84 years, and men above 85 years of age.

The age-adjusted ORs for psychiatric diagnoses in people with diabetes using people without diabetes as reference are shown in Table 3. When adjusted for age (by years), the ORs for any psychiatric diagnosis among subjects with diabetes

Table 1
Population of men and women in Stockholm County by Jan 1, 2011, divided between those with and without a recorded diagnosis of diabetes any time 2009–2013.

Age group	Women			Men		
	All	With diabetes	Without diabetes	All	With diabetes	Without diabetes
0–18	229,507	897 (0.39%)	228,610	242,178	1092 (0.45%)	241,086
19–34	227,992	1673 (0.73%)	226,319	229,535	2057 (0.90%)	227,478
35–64	408,716	16,130 (3.95%)	392,586	412,082	26,261 (6.37%)	385,821
65–74	90,214	10,708 (11.87%)	79,506	82,989	15,217 (18.34%)	67,772
75–84	52,461	8271 (15.77%)	44,190	37,268	7602 (20.40%)	29,666
85–	31,403	3985 (12.69%)	27,418	14,063	2210 (15.71%)	11,853
All ages	1,040,293	41,664 (4.01%)	998,629	1,018,115	54,439 (5.35%)	963,676