Contents lists available at ScienceDirect

Primary Care Diabetes

journal homepage: http://www.elsevier.com/locate/pcd

Original research

Diabetes treatment in people with type 2 diabetes and schizophrenia: Retrospective primary care database analyses

Wolfgang Rathmann[a], *Stefan Pscherer*[b], *Marcel Konrad*[c], *Karel Kostev*[c,d,*]

[a] *German Diabetes Center, Institute for Biometrics and Epidemiology, Düsseldorf, Germany*
[b] *Clinical Diabetes Center, Traunstein, Germany*
[c] *Fresenius University of Applied Sciences, Idstein, Germany*
[d] *IMS Health, Frankfurt, Germany*

ARTICLE INFO

Article history:
Received 6 December 2014
Received in revised form
27 March 2015
Accepted 4 April 2015
Available online 27 April 2015

Keywords:
Type 2 diabetes
Schizophrenia
Primary care
HbA1c

ABSTRACT

Aims: Aim of this study were to compare outcomes (HbA1c, BMI) and antidiabetic treatment of type 2 diabetes patients with and without schizophrenia under real-life conditions in primary care practices in Germany.

Methods: 1321 type 2 diabetes patients with and 1321 matched controls (age, sex, diabetes duration, diabetologist care, practice) without schizophrenia in 1072 general practices throughout Germany were retrospectively analyzed (Disease Analyser: 01/2009–12/2013). Antidiabetic treatment, HbA1c and BMI were compared using paired t-tests, McNemar tests and conditional logistic regression adjusting for macro- and microvascular comorbidity (ICD-10).

Results: Mean age (±SD) of patients and controls was 67.4 ± 13.2 years (males: 38.9%). Diabetes duration was 5.7 ± 4.3 years, 6% were in diabetologist care. Private health insurance was less often found among patients with schizophrenia than controls (2.2% vs 6.3%; $p < 0.0001$). There was no difference in the mean HbA1c values (cases: 7.1 ± 1.4%; controls: 7.2 ± 1.5%) (54.1 vs. 55.2 mmol/mol) ($p = 0.8797$) and in the average BMI (32.4 ± 6.6 vs. 31.0 ± 5.0 kg/m^2; $p = 0.2072$) between the two groups. Novel cost-intensive antidiabetic agents (DPP-4- or SGLT2-inhibitors, GLP-1 receptor agonists) were less often prescribed in cases (15.3 vs. 18.3%; $p = 0.0423$). However, in multivariable logistic regression, schizophrenia (odds ratio, 95%CI: 1.101; 0.923–1.317) was not associated with prescription use of novel antidiabetic agents (reference: other antidiabetic agents) after adjusting for private health insurance (OR: 2.139; 1.441–3.177) and comorbidity.

Conclusions: There is no evidence that type 2 diabetes patients with schizophrenia have worse diabetes control than those without a severe mental illness in general practices.

* Corresponding author at: Epidemiology & Evidence Based Medicine, Real World Evidence Solutions, IMS HEALTH GmbH & Co. OHG, Darmstädter Landstraße 108, 60598 Frankfurt am Main, Germany. Tel.: +49 0 69 66 04 4878.
E-mail address: kkostev@de.imshealth.com (K. Kostev).

http://dx.doi.org/10.1016/j.pcd.2015.04.001
1751-9918/

1. Introduction

Schizophrenia is associated with an increased risk of type 2 diabetes and cardiovascular disease, which contributes to a lower life expectancy in these patients [1–3]. Anti-psychotic drugs are related to a significant weight gain, which may be one underlying risk factor for the increased diabetes risk and higher cardiovascular morbidity in schizophrenia [4,5]. Patients with schizophrenia may also have less access to general healthcare with less opportunity for cardiovascular risk screening and prevention than in the non-psychiatric population [6].

The prevalence of type 2 diabetes is about 2–3 fold higher in people with schizophrenia compared to the general population [7]. The reasons for the increased incidence of type 2 diabetes in people with schizophrenia include genetic and lifestyle factors as well as disease and treatment specific effects [2,8]. The challenge for patients with both type 2 diabetes and schizophrenia is that the self-care demands of diabetes are large [8]. Patients with schizophrenia tend to be more non-compliant (e.g. adherence to medications) both with respect to anti-psychotic and non-psychiatric treatment [9].

Little is known about the quality of diabetes care in people with schizophrenia. In UK, the overall quality of diabetes management primary care was similar for patients with and without schizophrenia [10]. Results were as good on outcome measures (such as HbA1c) as on process measures (such as whether retinal screening was performed) [10]. A study in the US even found that HbA1c levels were lower among patients with schizophrenia than those of patients who did not have severe mental illness [11]. In Germany, no studies have examined the diabetes care of type 2 diabetes patients with schizophrenia. Thus, the objectives of this study were to compare outcomes (HbA1c, BMI) and antidiabetic treatment of type 2 diabetes patients with and without schizophrenia under real-life conditions in primary care practices in Germany.

2. Methods

The Disease Analyzer database (IMS HEALTH) assembles drug prescriptions, diagnoses, and basic medical and demographic data directly obtained from the computer system of general practitioners throughout Germany [12]. The analyzed database period was January 2009 to December 2013 (1072 general and internal medicine practices). First, all patients with a type 2 diabetes diagnosis and ≥1 prescription of oral antidiabetic agents or insulin were identified ($n = 196{,}075$). Then, all type 2 diabetes patients with specific diagnoses for schizophrenia (ICD10: F20, F21, F22, F25) were selected ($n = 1825$). Finally, 1:1 matching of pairs with and without schizophrenia was carried out among the diabetes patients (matching for age, sex, diabetes duration, diabetologist care, and practice).

Patient's characteristics and comorbidity were assessed based on the practice records. Macrovascular complications were determined based on primary care diagnoses (ICD-10 codes) for coronary heart disease (I24, I25), myocardial infarction (I21, I22, I23, I25.2), stroke (I63, I64, G45), peripheral vascular disease (I739, E105, E115, E145) and heart failure (I50). Microvascular complications included retinopathy (E113, E143, H360), neuropathy (E114, E144), and nephropathy (N18, N19, E112, E142, Z49, Z992). Presence of depression (F32, F33) was also assessed. Finally, the recorded HbA1c values and documented body mass index (BMI) were also included in the analyses.

Descriptive statistics were given and differences in characteristics of patients (with and without schizophrenia) were assessed using paired *t*-tests, and McNemars tests. Conditional logistic regression models were used to evaluate the association of schizophrenia with diabetes treatment adjusting for comorbidity and other variables (class statement: practice). Two sided tests were used and a *p*-value of <0.05 was considered as statistically significant. All analyses were carried out using SAS 9.3 (SAS Institute, Cary, USA).

3. Results

After 1:1 matching for age, sex, diabetes duration, diabetologist care and practice 1321 pairs of type 2 diabetes patients with and without diagnosed schizophrenia were included in the analyses. The clinical characteristics are given in Table 1. Mean age was 67 years and about two third were women. The average recorded duration of diabetes was 5.7 years, only 6% were in specialized diabetologist care. Cases with schizophrenia were significantly less often privately health insured ($p < 0.0001$). The mean last recorded HbA1c values were almost identical in both groups, as well as the average body mass index (Table 1). There was no difference in average HbA1c value between schizophrenia patients with and without an antipsychotic medication.

The comorbidity of cases with schizophrenia and matched controls is shown in Table 2. Although cardiovascular risk factors (hypertension, hyperlipidemia) were slightly less often present in cases than in controls, the prevalence of stroke and peripheral vascular disease was substantially higher in patients with schizophrenia (Table 2). In addition, microvascular diabetes complications (retinopathy, nephropathy) were more often found in cases than in controls. Finally, the prevalence of diagnosed depression was higher in diabetes patients with schizophrenia than in controls ($p < 0.0001$).

Prescription use of antidiabetic agents and insulin in cases and controls is shown in Table 3. Metformin monotherapy was less often used in cases, who were more frequently treated with sulfonylureas (both in combination with metformin or as monotherapy) compared to controls. Novel more cost-intensive antidiabetic agents (DPP-4 inhibitors, GLP-1 receptor agonists, SGLT2 inhibitors) were less often used in patients with schizophrenia than in controls. Prevalence of insulin therapy (alone or combinations with oral agents) was two-fold higher in cases than in controls without schizophrenia ($p < 0.0001$).

The association of schizophrenia with prescription use of novel antidiabetic drugs was further explored using multivariable conditional logistic regression (Table 4). After adjusting for covariables, schizophrenia was not related to prescription