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Clinical characteristics of individuals with serious mental illness and type 2 diabetes

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Abstract

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Aims—Diabetes is a prevalent comorbidity in people with serious mental illness. Data from 157 individuals with serious mental illness and comorbid for diabetes enrolled in an ongoing treatment study were used to examine clinical correlates of diabetes control.

Methods—Measures included depressive symptoms (Montgomery Asberg Depression Rating), global psychopathology severity (Brief Psychiatric Rating Scale) and HbA1c, a biomarker of diabetes control.

Results—Seventy-seven participants had depression, forty schizophrenia, forty bipolar disorder. Most were moderately to severely depressed with poor diabetes control. Correlation between diagnosis and diabetes control was eliminated after adjusting for gender, race, health literacy, diabetes duration and diabetes knowledge. More depression and longer diabetes duration were related to poorer diabetes control. Lower global psychiatric severity was related to worse diabetes control, perhaps due to the overall low psychosis and mania levels.

Conclusions—People with serious mental illness and diabetes have multiple challenges, which, along with severe depression, may impede diabetes self-management.

Introduction

Metabolic disorders are increasing in the United States with 25.8 million Americans having diabetes (1). Individuals with serious mental illness like schizophrenia, bipolar disorder and severe depression are at particular risk for metabolic disorders. Side effects of psychotropic drugs, especially second-generation antipsychotics, and unhealthy behaviors such as reduced physical activity and poor diet predispose people with serious mental illness to diabetes. Unfortunately, recent intervention studies for comorbid depression and diabetes specifically excluded patients with psychosis and included many patients with only mild or moderate depression (2, 3) making it difficult to generalize findings to more severely ill populations.

Given the limited study of comorbid diabetes in patients with serious and persistent mental illness (4) it is reasonable to explore clinical correlates among sub-groups that could differentially impact care. This analysis investigated factors known to affect outcomes in a well-characterized research sample of people with serious mental illness and Type 2 diabetes. We anticipated that global psychiatric symptoms, including depression, would have a negative relationship to diabetes control and that diagnostic sub-groups might differ on factors which could have implications for clinical management.

Methods

Baseline data were used from 157 adults enrolled in a National of Institute of Mental Health (NIMH) funded randomized control trial testing a novel intervention vs. treatment as usual among individuals comorbid for serious mental illness and diabetes, conducted in a safety-net primary care setting. The study was approved by the local Institutional Review Board, and written informed consent was obtained. Enrollment for the study began in November 2011 and is currently ongoing. Inclusion criteria included having schizophrenia, schizoaffective disorder, bipolar disorder or major depression, confirmed with the Mini-International Neuropsychiatric Interview (5) and having diabetes by history or laboratory

values. Exclusion criteria included being actively suicidal or homicidal, having dementia, or being unable to participate in groups.

Seventy-seven participants had major depression, forty schizophrenia or schizoaffective disorder, and forty bipolar disorder. Mean age was 52.9±9.8, 65 % were women, 40% were African American, and 10% were other minorities. They had serious mental illness for 18.1±12.2 years, and diabetes for 10.4±7.8 years.

Diabetes control was assessed with HbA1c, a measure of glucose levels over the previous 3 months. Depression was measured with the Montgomery Asberg Depression Rating Scale (MADRS) (6). The Brief Psychiatric Rating Scale (BPRS) (7) measured global psychiatric symptoms. Diabetes knowledge was assessed with the Brief Diabetes Knowledge Test, which has been used successfully with people with serious mental illness (8). Health literacy was assessed with a measure utilized to detect persons with limited health literacy in primary care (9).

Analyses were conducted using SAS Version 9.2 and R. We utilized p-values from the nonparametric Kruskal–Wallis one-way analysis of variance by ranks across diagnostic groups to compare subgroups of people with serious mental illness. Bivariate Spearman correlations between HbA1c, MADRS and BPRS scores, both overall and within the three diagnosis groups were assessed. Linear regression models examined if the association between the dependent variable HbA1c and the independent variables (MADRS, BPRS, and diagnosis group) changed after controlling for covariates. In separate models, while also adjusting for any lower-level interaction terms and main effects, our primary measures of interest were: a three-way interaction term between MADRS, BPRS and diagnosis; two-way interaction term between diagnosis and MADRS and diagnosis and BPRS; main effects for diagnosis, BPRS and MADRS; a main effect for only diagnosis; a main effect for only BPRS; and a main effect for only MADRS. Covariates included factors related to diabetes control (race, gender, health literacy, diabetes knowledge and diabetes duration). We then performed residual analysis and made appropriate transformations to the data when necessary, if regression assumptions were violated. As a result of the residual analysis, we use a logarithm transformation for HbA1c. Finally, we separately assessed associations between the 5 BPRS factors (affect, positive symptoms, negative symptoms, activation and resistance), forming latent constructs using confirmatory factor analysis, and HbA1c using a structural equation modeling approach. All statistical tests are two-tailed with significance defined as $\alpha = .05$.

Results

The diagnostic groups differed significantly on race ($p<.01$) (larger proportion of Caucasian with schizophrenia); duration of diabetes ($p<.02$) (longest in depression group); and duration of mental illness ($p<.05$) (longest in schizophrenia group), and health literacy for completing forms ($p<.02$) (schizophrenia group worst). There were no significant cross-group differences in age, education or gender proportion. A more detailed summary of sub-group characteristics is presented in an on-line appendix.

The diagnostic groups differed significantly ($p<.01$) on HbA1c, with the major depression group having the highest levels (all group had mean levels > 7.5%), and on diabetes knowledge ($p<.01$) (schizophrenia group worst). The groups did not differ on insurance status, marital status, insulin use, body mass index or self-reported presence of significant medical comorbidity (10).

Participants were generally moderately to severely depressed (total MADRS score, all > 21), while global psychotic symptoms were low (total BPRS score, all < 45). The groups differed significantly on BPRS ($p<.0001$), global psychopathology (11) ($p<.0004$), and on functional status (12) ($p<.002$) with the schizophrenia group worst on all measures. Groups also differed on insight into mental illness (13) with the schizophrenia group worst. The groups did not significantly differ on the MADRS or on social support (14). Levels of support were low for all groups. There was no association between diagnosis and HbA1c in our linear regression model after adjusting for race, gender, health literacy, diabetes knowledge and duration of diabetes and no significant interaction terms with diagnosis group in any of our linear regression models.

We analyzed the relationship between HbA1c and total scores on BPRS and MADRS using regression analysis. Our hypothesis that BPRS and MADRS were positively correlated ($\rho = .57$) was confirmed. However, while HbA1c and MADRS were positively associated ($\rho = .26$), the bivariate Spearman correlation between HbA1c and BPRS was close to zero ($\rho = .02$). After adjusting for race, sex, literacy, diabetes knowledge and duration of diabetes in our multivariate regression model, we found both MADRS and BPRS to be associated with HbA1c (Table 1). In the multivariate model MADRS total scores appeared to be positively correlated with HbA1c, while the association with BPRS with HbA1c was negative. On BPRS factor assessment, the affective factor showed a similar positive association with HbA1c as seen with the MADRS and HgA1c. The other BPRS factors, which are conceptually concordant with psychosis, were inconsistently and weakly associated with HgA1c. Longer duration of having diabetes was associated with poorer diabetes control. We found no significant interaction between MADRS and BPRS.

Discussion

In our primary care, safety net health system sample of patients with serious mental illness, psychiatric symptoms appear related to diabetes control. After controlling for covariates in the model, higher depressive symptoms were associated with poorer diabetes control. After controlling for covariates in our statistical model and adjusting for depressive severity, global psychopathology severity, as measured by the BPRS was unexpectedly and negatively related to HbA1c. Clinical interpretation of MADRS and BPRS scores in our sample suggest participants were mainly depressed and symptoms of schizophrenia or bipolar disorder such as hallucinations or mania were relatively subtle. While decreases in BPRS seem counter-intuitively related to worse diabetes control, it must be noted that psychotic symptoms in this sample were mild. At the lower end of the BPRS, minor differences in total scores may have limited clinical relevance. It is also possible that individuals with more obvious psychosis might receive additional clinical attention that is helpful for diabetes outcomes. It also must be noted that the inconsistent and relatively weak

BPRS psychosis factor findings limit interpretation of the relationship between BPRS and diabetes control in this analysis.

Pervasive and severe depressive symptoms appear to be a major impediment to diabetes self-management in our sample. This is consistent with increasing awareness of the impact of depression on diabetes, although recent reviews of this relationship (3, 15) are limited by the fact that they have not generally included people who have depression in the context of chronic psychotic or cyclical mood disorders.

Serious mental illness that is characterized by disorders of thought, perception or mood present unique challenges to clinicians and caregivers. Our findings, while limited by cross-sectional methods, single-site enrollment, and absence of health service use data still have clinical relevance. In our sample, patients with serious mental illness and diabetes tended to be quite depressed. Low health literacy, low levels of functioning, and limited insight might all be expected to be barriers to being able to benefit from diabetes programs available in "routine" primary care settings. Psychiatric symptoms, especially severe depression, may impede management of the many components of successful diabetes self-care. Effective self-management approaches need to take into account the specific and unique challenges that serious mental illness can create for treating comorbid diabetes. A growing literature suggests that diabetes care that is targeted to people with serious mental illness can improve outcomes (4), but more research is needed on refining approaches, and how they can be translated to practical venues for diabetes care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Correlates of Diabetes Control (HbA1c) in relation to depressive symptoms, global psychopathology, and duration of diabetes

Estimate	adjusted r	p-value
MADRS[a] score	.37	<.001
BPRS[b] score	-.25	.013
factor(race1)1	-.10	.270
factor(sex1)1	.07	.352
Health literacy1[c]	-.06	.623
Health literacy2[d]	.03	.775
Health literacy3[e]	-.10	.389
Diabetes Knowledge	-.03	.742
Diabetes duration in years	.28	<.001

[a] MADRS = Montgomery Asberg Depression Rating Scale

[b] BPRS = Brief Psychiatric Rating Scale

[c] Health literacy 1= written information

[d] Health literacy 2= reading hospital materials

[e] Health literacy 3= confidence filling out forms