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Independence of diabetes and obesity in adults with serious mental illness: Findings from a large urban public hospital

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ABSTRACT

Objective: There is limited research on metabolic abnormalities in psychotropic-naïve patients with serious mental illness (SMI). Our study examined metabolic conditions in a large, ethnically diverse sample of psychotropic-naïve and non-naïve adults with SMI at an urban public hospital.

Methods: In this cross-sectional study of 923 subjects, the prevalences of hyperglycemia meeting criteria for type 2 diabetes mellitus (T2DM) based on fasting plasma glucose and obesity defined by BMI and abdominal girth were compared across duration of psychotropic medication exposure. Multiple logistic regression models used hyperglycemia and obesity as dependent variables and age, sex, race/ethnicity, and years on psychotropics as independent variables.

Results: Psychotropic-naïve patients, including both schizophrenia and non-psychotic subgroups, showed an elevated prevalence of hyperglycemia meeting criteria for T2DM and a decreased prevalence of obesity compared to the general population. Obesity rates significantly increased for those on psychotropic medications more than 5 years, particularly for patients without psychosis (BMI: aOR = 5.23 CI = 1.44–19.07; abdominal girth: aOR = 6.40 CI = 1.98–20.69). Women had a significantly higher obesity rate than men (BMI: aOR = 1.63 CI = 1.17–2.28; abdominal girth: aOR = 3.86 CI = 2.75–5.44). Asians had twice the prevalence of hyperglycemia as whites (aOR = 2.29 CI = 1.43–3.67), despite having significantly less obesity (BMI: aOR = .39 CI = .20-.76; abdominal girth: aOR = .34 CI = .20-.60). Hispanics had a higher rate of obesity by BMI than whites (aOR = 1.91 CI = 1.22–2.99).

Conclusions: This study showed disparities between obesity and T2DM in psychotropic-naïve patients with SMI, suggesting separate risk pathways for these two metabolic conditions.

1. Introduction

Metabolic syndrome is a cluster of conditions that tend to occur together and increase a patient's risk of cardiovascular disease, T2DM, stroke, and all-cause mortality (Kaur, 2014). Metabolic syndrome is associated with a three times higher risk of death from coronary heart disease and twice the risk of all-cause mortality (Lakka et al., 2002). T2DM and obesity are chronic medical diseases associated with metabolic syndrome that have increased dramatically in the U.S. population (Barnes, 2011). These trends are particularly alarming for patients with SMI who demonstrate 1.5–2 fold the prevalence of T2DM, dyslipidemia, hypertension, and obesity compared to the general population (Newcomer and Hennekens, 2007), along with less favorable outcomes, which contributes to an estimated 10–20 year decreased life expectancy (Chesney et al., 2014). Factors posited to explain the increased rate of metabolic disorders among those with SMI include psychotropic medications, genetics, unhealthy lifestyles, low socioeconomic status, cigarette smoking, and healthcare inequalities (Lawrence and Kisely,

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2010, Padmavati, 2016).

Antipsychotic use is reported to increase the risk of T2DM, although of an uncertain magnitude, and almost all antipsychotics are associated with weight gain (Correll et al., 2015). Mood stabilizers, including lithium and valproic acid, and many antidepressants, such as amitriptyline and mirtazapine, produce lesser weight gain than that associated with antipsychotic use (Correll et al., 2015, Mcknight et al., 2012). Although mood stabilizers also increase the risks for insulin resistance and T2DM (Belcastro et al., 2013, Chien et al., 2012), findings are inconclusive regarding a possible association between antidepressants and T2DM (Correll et al., 2015).

While the relationship between psychotropic medications and metabolic syndrome has long been known, there is emerging evidence of an inherent predisposition to certain metabolic conditions among some patients with SMI. Research on psychotropic-naïve or first-episode patients has primarily focused on patients with schizophrenia. Multiple studies have demonstrated an increased prevalence of impaired fasting glucose tolerance in psychotropic-naïve patients with schizophrenia (Ryan et al., 2003, Spelman et al., 2007), although some studies have not found such elevations in fasting plasma glucose (Padmavati et al., 2010). A recent meta-analysis, however, demonstrated elevations in several indicators of dysglycemia including fasting plasma glucose levels in first-episode patients with schizophrenia compared to matched controls (Pillinger et al., 2017a). While one small study in 2002 with 15 patients found that psychotropic-naïve patients with schizophrenia had increased central obesity compared to matched controls (Thakore et al., 2002); more recent larger studies do not show an increased prevalence of obesity in psychotropic-naïve patients with schizophrenia (Padmavati et al., 2010, Verma et al., 2009).

Effects of sex and race/ethnicity are rarely considered in studies of metabolic parameters in patients with SMI. In the general population, males have a slightly higher rate of diabetes than females, 8.7% vs. 7.7% (CDC, 2009); however, there is limited research on sex differences in T2DM risk among patients with SMI. One community study of 1123 patients with schizophrenia in Canada showed no significant differences (Voruganti et al., 2007). Regarding sex differences in obesity, females with SMI have a significantly higher prevalence of obesity than their male counterparts (Carliner et al., 2014, Jonikas et al., 2016).

A review examining racial/ethnic differences in diabetes found that persons with African ancestry and Hispanics appear to be at a higher risk of diabetes than whites with SMI (Carliner et al., 2014), but studies on the association between race/ethnicity and obesity in patients with SMI are limited and inconclusive. Some studies showed increased obesity in those with African ancestry and Hispanics compared to whites with SMI, while others demonstrated no significant differences in obesity by race/ethnicity (Carliner et al., 2014).

Our metabolic screening study at Bellevue Hospital Center, a large public hospital in New York City, provided a unique opportunity to analyze the cross-sectional prevalence of two metabolic conditions, hyperglycemia and obesity, in patients with SMI with respect to duration of psychotropic medication treatment and demographic variables. The primary aim of our study was to look at the prevalence of metabolic conditions in psychotropic-naïve patients with schizophrenia and other SMI as there is a scarcity of studies with large, diverse samples of psychotropic-naïve patients. We also examined associations between the two metabolic conditions and the hypothesized predictors: years on psychotropics, sex, and race/ethnicity. Additionally, this study explored the likelihood of hyperglycemia and obesity by years on psychotropics in psychotic and non-psychotic patients separately in order to draw comparisons between these two groups.

2. Methods

2.1. Data sources

In accordance with FDA recommendations, a protocol was implemented to screen all adult psychiatric inpatients for metabolic syndrome from 2006 to 2009. The human subjects committee at Bellevue Hospital Center approved the protocol. On admission, patients underwent a set of metabolic laboratory tests and physical measurements, and an attending psychiatrist on the inpatient unit obtained additional information through patient interview, medical records, and collateral sources. The data included information on demographic and clinical measures, such as weight, height, body mass index (BMI), abdominal girth, blood pressure, fasting plasma glucose, triglycerides, high-density lipoprotein (HDL) cholesterol, patient history of diabetes, diagnosis, presence or absence of psychosis, psychotropic medications prescribed within six months of admission, and years on psychotropics. Data was entered into a “Metabolic Findings Form” (MFF), developed to capture information about the predictors of metabolic syndrome for future analysis.

2.2. Conditions of metabolic syndrome

Hyperglycemia and obesity were defined in accordance to the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III), American Diabetic Association (ADA), and Center for Disease Control (CDC) guidelines (Huang, 2009, ADA, 2016, CDC, 2016). Patients were categorized with regards to hyperglycemia as normal (fasting plasma glucose < 100 mg/dL), hyperglycemia meeting criteria for pre-diabetes (fasting plasma glucose 100–125 mg/dL), and hyperglycemia meeting criteria for T2DM (fasting plasma glucose ≥ 126 mg/dL) (ADA, 2016). Those with a history of diabetes were categorized as having hyperglycemia meeting criteria for T2DM. Additionally, patients were categorized by NCEP ATP III criteria for a binary logistic regression analysis. Using this criteria to define hyperglycemia dichotomously, a single hyperglycemia group was defined for fasting plasma glucose ≥ 100 mg/dL that also included all patients with a history of diabetes (Huang, 2009).

Based on NCEP ATP III criteria, males with abdominal girth > 40 inches and females with abdominal girth > 35 inches at the level of the navel were categorized as obese by abdominal girth (Huang, 2009). Since the NCEP ATP III criteria does not define obesity by BMI, the CDC criteria that categorizes obesity as BMI ≥ 30 was employed (CDC, 2016).

2.3. Psychiatric diagnosis

Primary diagnoses were made pursuant to DSM-IV criteria by an inpatient academic psychiatrist. They included schizophrenia, schizoaffective disorder, psychosis NOS, bipolar disorder, depressive disorder, mood disorder NOS, psychiatric diagnosis secondary to a primary medical condition, and “other psychiatric diagnosis”. Patients were also categorized as either psychotic or non-psychotic based on symptoms at admission, regardless of primary diagnosis.

2.4. Psychotropic medications

Psychotropic medications prescribed during the past six months prior to admission were categorized as follows: first-generation antipsychotics, second-generation antipsychotics, selective serotonin reuptake inhibitors (SSRIs), mood stabilizers, anticonvulsants, and “other psychiatric medications”. The length of time on any psychotropic medication was recorded as never, < 1, 1 to 5, or > 5 years.

2.5. Demographic categories

Patients were categorized into one of four age groups: ≤ 24, 25 to 39, 40 to 54, and ≥ 55 years. Racial/ethnic groups included white, African ancestry, Hispanic, Asian, and “other race/ethnicity”. The Asian group consisted of East Asians and Pacific Islanders. South Asians were categorized in the “other race/ethnicity” group.