Body mass index (BMI) in newly admitted child and adolescent psychiatric inpatients

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Abstract

Introduction: Obesity is a major problem among children and adolescents suffering from chronic mental illness. State-of-the-art measures such as body mass index (BMI) and growth-related weight charts are now readily available to clinicians and investigators interested in psychotropic drug-associated weight gain in the pediatric population. However, no reports that utilize such measures in large series of children and adolescents with psychiatric disorders are available.
Methods: The authors employed the Nutstat module of the Centers for Disease Control and Prevention (CDC) Epi Info software to assess BMI in a psychiatry inpatient child and adolescent population in Central Virginia. The authors also developed a scoring system to relate psychotropic administration to BMI.
Results: Children and adolescents with chronic mental illness had greater BMI measurements than the general pediatric population. Our scoring system found a relationship between antipsychotic drug administration and increased BMI that almost reached a level of significance ($p = 0.062$).
Conclusions: The present methodology using absolute weight to assess psychotropic drug-associated increase in body weight for children and adolescents is unsatisfactory. The authors offer a new and convenient methodology to correct this problem.
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1. Introduction

The problem of obesity is progressively worsening in children and adolescents (Strauss and Pollack, 2001; Flegal et al., 2001; Ogden et al., 2002) The American Academy of Pediatrics (Committee on Nutrition, 2003) recommends that clinicians determine body mass index (BMI) and report this measurement using nationally determined growth charts.

This practice should be incorporated into the care of children and adolescents with mental illness.

Child and adolescent psychopharmacologists do not have easy access to reviews of mental illness and obesity. Standard textbooks on child and adolescent psychopharmacology do not include obesity in the index (Kutcher, 2002; Martin et al., 2003), and standard textbooks of child and adolescent obesity do not include mental illness in the index (Burniat et al., 2002). Reviews of childhood eating disorders where antipsychotic drug administration may be considered focus on under-eating rather than over-eating (DelBello and Grcevich, 2004).

Theisen et al. (2001) studied the prevalence of obesity in adolescents and young adults with and without schizophre-

nia and in relationship to antipsychotic drugs. Because this study was conducted in Germany, German national standards for sex and age were used to determine BMI percentiles for obesity. Obesity was listed when BMI was at, or exceeded, the 90th percentile. For the whole study population, obesity was found in 45% of the male and 59% of the female inpatients. Among subjects with schizophrenia spectrum disorders, obesity was found in 51% of male and 64% of female patients compared with 33% obesity prevalence in patients without schizophrenia. The prevalence of obesity was greater in study subjects treated with newer but not older antipsychotic drugs.

Much has been written about drug-induced and drug-associated obesity in adults, particularly among adult patients receiving antipsychotic drugs (Allison et al., 1999; Allison and Casey, 2001). Less well documented is the potential for psychotropic drugs to induce or exacerbate obesity in children and adolescents with psychiatric illness. Articles identifying drug-induced or drug-associated obesity among children and adolescents with a major focus on antipsychotic drugs have appeared (Kelly et al., 1998; Martin et al., 2000; Hellings et al., 2001; Saito and Kafantaris, 2002; Zalsman et al., 2003; Mozes et al., 2003; Ross et al., 2003). However, these reports have not used the technology recommended by the American Academy of Pediatrics (Committee on Nutrition, 2003).

To better understand the problem of obesity among children and adolescents with mental illness using methodology recommended by the American Academy of Pediatrics(Committee on Nutrition, 2003) and begin to explore the relationship between drugs and obesity among pediatric patients with mental illness, the authors studied children and adolescents newly admitted to a dedicated psychiatric inpatient unit. Our methodology used the *Nutstat* module of the *Epi Info* software program (Division of Public Health Surveillance and Informatics, 2003) for anthropometric determinations developed by the Centers for Disease Control and Prevention (CDC). This program is available on the Internet at no cost and is based on the CDC 2000 Growth Charts (Kuczmarski et al., 2000).

2. Methods

2.1. Subjects

The study population comprised 300 youths newly admitted to a large private psychiatric facility during 2002 and 2003. This facility is located in south central Virginia (Piedmont area). The surrounding countryside is largely rural. Referrals arrive from all parts of Virginia. Each patient was evaluated by the same experienced child and adolescent psychiatrist (E.J.K.). The research technician (L.J.K.) carefully reviewed these records to extract the data.

Of the 300 study subjects, 276 children and adolescents had a primary diagnosis of a mood disorder and 24

had a primary diagnosis of a psychotic disorder. No youths were admitted with a primary diagnosis of substance abuse. Secondary diagnoses were not sufficiently consistent and specific to determine the frequency with which substance abuse was present on admission. Most patients had multiple comorbidities and long histories of previous psychiatric and psychological treatments including outpatient therapy and medication management, residential treatment, and previous psychiatric inpatient treatment. That is, most study subjects had received a variety of psychotropic medications over the course of many years. The patient population was diverse but predominantly middle to lower socioeconomic groups.

2.2. Database

Variables extracted from each patient's admission record included date of birth, date of measurement, height in inches, weight in pounds, psychotropic and non-psychotropic medications, psychiatric diagnoses, medical diagnoses, and problems such as asthma and enuresis, sex, race, grade in school, and regular school or special education. All study patients were inpatients.

The authors entered birth date, date of measurement, sex, height, and weight into the *Nutstat* module of *Epi Info* (Division of Public Health Surveillance and Informatics, 2003) and extracted the variables BMI, BMI percentile, and BMI z-score. This software package employs statistical principles and data derived from the CDC 2000 Growth Charts (Kuczmarski et al., 2000; National Center for Health Statistics, 2000).

The authors developed a rating scale of weight-gain burden for antipsychotic drugs (Table 1). Our estimates derived largely from reports of child, adolescent, and adult subjects with chronic mental illness (Kelly et al., 1998; Ghaemi and Katzow, 1999; Allison et al., 1999; Tohen et al., 1999; Melkerrson et al., 2000; Tohen et al., 2000; Remschmidt et al., 2000; Martin et al., 2000; Haapasalo-Pesu and Saarijarvi, 2001; Sanger et al., 2001; Cohen et al., 2001; Theisen et al., 2001; Hellings et al., 2001; Aman et al., 2002; Werneke et al., 2002; Ratzoni et al., 2002; Research Units on Pediatric Psychopharmacology Autism Network, 2002; Martin and L'Ecuyer, 2002; Pavuluri et al.,

Table 1
Relative weight changes with antipsychotic drugs among 73 subjects taking older or newer agents

0	+0.5	+1	+2
Aripiprazole (Abilify) [1] Ziprasidone (Geodon) [3]	Haloperidol (Haldol) [1]	Chlorpromazine (Thorazine) [13] Quetiapine (Seroquel) [18] Risperidone (Risperdal) [31]	Olanzapine (Zyprexa) [14]

A total of 81 antipsychotic drugs were prescribed for these 73 youths. Drug score for each patient was a sum of these relative weight changes. Specific drug frequency appears in brackets.