Research report

Relationship between sunlight and the age of onset of bipolar disorder: An international multisite study

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ABSTRACT

Background: The onset of bipolar disorder is influenced by the interaction of genetic and environmental factors. We previously found that a large increase in sunlight in springtime was associated with a lower age of onset. This study extends this analysis with more collection sites at diverse locations, and includes family history and polarity of first episode.

Methods: Data from 4037 patients with bipolar I disorder were collected at 36 collection sites in 23 countries at latitudes spanning 3.2 north (N) to 63.4 N and 38.2 south (S) of the equator. The age of onset of the first episode, onset location, family history of mood disorders, and polarity of first episode were obtained retrospectively, from patient records and/or direct interview. Solar insolation data were obtained for the onset locations.

Results: There was a large, significant inverse relationship between maximum monthly increase in solar insolation and age of onset, controlling for the country median age and the birth cohort. The effect was reduced by half if there was no family history. The maximum monthly increase in solar insolation occurred in springtime. The effect was one-third smaller for initial episodes of mania than depression. The largest maximum monthly increase in solar insolation occurred in northern latitudes such as Oslo, Norway, and warm and dry areas such as Los Angeles, California.

Limitations: Recall bias for onset and family history data.

Conclusions: A large springtime increase in sunlight may have an important influence on the onset of bipolar disorder, especially in those with a family history of mood disorders.

1. Introduction

Sunlight provides warmth, stimulates vision, initiates vitamin D synthesis, and plays a fundamental role in how the circadian clock adapts human physiology and behavior to the alternation of day and night (Berson, 2003; Brainard and Hanifin, 2005; Hatori and Panda, 2010). Circadian rhythms are involved in regulation of mood (Albrecht, 2010; McClung, 2013) and abnormalities in circadian rhythms are thought to underlie bipolar disorder (Goodwin and Jamison, 1990; Mansour et al., 2005; McClung, 2007). We previously found that the larger the springtime increase in solar electromagnetic energy striking the surface of the earth (insolation) at the onset location, the younger the age of onset of bipolar disorder (Bauer et al., 2012).

The emergence of bipolar disorder involves the interaction of complex genetic mechanisms (Burmeister et al., 2008; Craddock and Sklar, 2013; Petronis, 2003) and environmental factors (Tsuchiya et al., 2003). Based on 6 studies of 2509 patients with bipolar I disorder, the weighted mean age of onset falls into 3 groups, having peaks at ages 18.1, 26.9 and 42.7 years, with 55% of patients in the middle or late onset groups (Bellivier et al., 2001, 2003; González Pinto et al., 2009; Hamshere et al., 2009; Lin et al., 2006; Manchia et al., 2008). This broad range of onset and the polygenic basis of bipolar disorder suggest that environmental factors have an influential role (Burmeister et al., 2008; Craddock and Sklar, 2013; Wright et al., 2003). Environmental factors associated with a younger age of onset are cannabis use (González-Pinto et al., 2008; Lagerberg et al., 2011), stressful life events (Horesh et al., 2011) and childhood abuse (Garno et al., 2005; Leverich et al., 2002), while neurological illness is associated with an older onset (Depp and Jeste, 2004). The purpose of this study was to repeat our prior investigation of the association between solar insolation and the age of onset of bipolar disorder using a substantially larger sample, and including information on family history and polarity of the first episode.

2. Methods

2.1. Patient data

All patients included in this study had a diagnosis of bipolar disorder according to DSM-IV criteria made by a psychiatrist. Approval for this study was obtained from institutional review boards according to local requirements. Patient data were

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