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Increased risk of hypertension in patients with anxiety disorders: A population-based study

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ABSTRACT

Objective: We designed this study to examine the prevalence and incidence of hypertension and risk factors in patients with anxiety disorders.
Methods: The National Health Research Institute provided a database of 1,000,000 random subjects for study. We obtained a random sample of 766,427 subjects aged ≥18 years in 2005. The differences in the prevalence of hypertension between patients with anxiety disorders and the general population in 2005 were tested by multiple logistic regression adjusted for other covariates, including age, sex, insurance amount, region, urbanicity and depression. The differences in the incidence of hypertension between patients with anxiety disorders and the general population according to age group and sex from 2006 to 2010 were tested by a Cox regression adjusted for the other covariates.
Results: The prevalence of hypertension in patients with anxiety disorders was higher than that in the general population (37.9% vs. 12.4%, odds ratio, 2.61; 95% confidence interval, 2.52–2.70) in 2005. The average annual incidence of hypertension in patients with anxiety disorders from 2006 to 2010 was also higher than that in the general population (3.63% vs. 1.95%, risk ratio, 1.29; 95% confidence interval, 1.23–1.36). Compared with the general population, patients with anxiety disorders had a higher incidence of hypertension in all age and sex groups.
Conclusions: Patients with anxiety disorders had a higher prevalence and a higher incidence of hypertension than that in the general population. Age, male sex, diabetes, and hyperlipidemia were risk factors for hypertension in patients with anxiety disorders.

Introduction

Hypertension and anxiety disorders both cause substantial morbidity to patients and cost to the health care system [1]. The relationship of anxiety to the development of hypertension has been a subject of controversy with mixed findings in large-scale observational studies [1]. Hypertension is an important risk factor for the development of coronary heart disease. There is increasing evidence that anxiety is associated with coronary artery disease [1–3], as a 3-fold increased risk for cardiovascular disease has been observed in patients with anxiety disorders compared with the general population over a 10-year period.

Some studies have examined the relationship between anxiety and hypertension [4–7]. However, no conclusive association between anxiety disorders and hypertension has been shown. Several studies seemly have found an association between anxiety and hypertension [8–12]. One study showed hypertension in men was statistically related to anxiety but not depression [8]. Another study revealed that anxiety patients from a psychiatric disease registry had higher rates of hypertension compared to the general population [9]. Other earlier prospective investigations have consistently found the anxiety trait (daily stress, emotional lability, tension, anger symptoms, and ambitiousness) predictive of later high blood pressure [10–12]. A review of 15 prospective studies of psychological traits affecting the development of hypertension found small but significant effects of anger, anxiety, depression, and other variables [6]. Thus, no population-level studies to date have investigated the association between anxiety disorders and hypertension. Literature on mental disorders and hypertension did not look specifically at a variety of anxiety disorders [4].

A population-based 22-year follow-up cohort of 3310 normotensive persons without chronic diseases from the National Health and Nutrition Examination Survey I (NHANES I) found that combined symptoms of depression and anxiety ("negative affect") were associated with an increased risk for hypertension [13]. Similarly, another study found a

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significant association of hypertension with the co-occurrence of generalized anxiety disorder and major depressive disorder but not either disorder alone [14]. Conversely, in a Norwegian epidemiological study, high baseline depression and anxiety symptoms predicted lower systolic blood pressure at 11-year follow-up [15]. Similarly, a 15-year prospective study of psychosocial risk factors for hypertension based on a follow-up of more than 3000 young adults found that two components of Type A behavior, "time urgency–impatience" and "hostility", were each associated with almost double the rate of incident hypertension, while anxiety symptoms, depression symptoms, and "achievement-striving–competitiveness" (another Type A component) did not predict hypertension [16].

In summary, there are many limitations in previous studies. First, they mixed many different types of psychological factors together and did not focus on anxiety alone. Second, most of the measures of anxiety in these studies were not using a clinical diagnosis or a formal diagnosis of anxiety disorders. Third, a majority of the studies are cross-sectional and do not allow us to determine the temporality of any possible associations.

Taiwan implemented a National Health Insurance program in March 1995, offering a comprehensive, unified, and universal health insurance program to all citizens and expatriates in Taiwan. The coverage provides outpatient services, inpatient care, Chinese medicine, dental care, childbirth, physical therapy, preventive health care, home care, and rehabilitation for chronic mental illness.

This study tests the hypothesis of a positive association between anxiety disorders and hypertension. We first compared the prevalence of hypertension in 2005 and factors associated with hypertension between patients with anxiety disorders and the general population. Second, we compared the incidence of hypertension in patients with anxiety disorders and the general population from 2006 to 2010. Finally, we detected the risk factors for hypertension in patients with anxiety disorders during the same period.

Methods

Sample

The National Health Insurance database of medical claims includes outpatient care, inpatient care, dental services, and prescription drugs. The National Health Research Institutes provided a database of 1,000,000 random subjects, about 4.5% of the total population (22.6 million), to perform a related health service study. Longitudinal Health Insurance Database 2005 contains the original claim data of 1,000,000 beneficiaries enrolled in 2005 randomly sampled from the year 2005 Registry for Beneficiaries of the National Health Insurance Research Database, where registration data of everyone who was a beneficiary of the National Health Insurance program during the period of 2005 were drawn for random sampling. All the registration and claim data of these 1,000,000 individuals collected by the National Health Insurance program constitute the Longitudinal Health Insurance Database 2005. There were no statistically significant differences in age, sex, and average insured payroll-related amount between the sample group and all enrollees. In the current study, we obtained a random sample of 766,427 subjects aged ≥18 years (all of whom were over 18) from the 2005 database. This study was approved by the Institutional Review Board of Taoyuan Psychiatric Center.

Definition of anxiety disorders

The National Health Insurance in Taiwan uses diagnostic coding that follows the International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) diagnostic criteria. We identified study subjects who had at least two service claims during 2005 for either outpatient or inpatient care with a primary or secondary diagnosis of anxiety disorders, which includes anxiety states, panic disorder, generalized anxiety disorder, phobic disorder, obsessive–compulsive disorder, acute stress disorder, and post-traumatic stress disorder (ICD-9-CM: 300.0, 300.2, 300.3, 308.3, and 309.81).

Definition of hypertension

For the accuracy of diagnosis, we adopted study subjects who had a primary or secondary diagnosis of hypertension (ICD-9-CM: 401–405) and combined with antihypertensive drug treatment identified as hypertension [17]. Thus, we considered both ICD-9-CM diagnosis and antihypertensive drug treatment to validate the diagnosis of hypertension in the current study. Generally, the typical criteria used to determine a diagnosis of hypertension for physicians in Taiwan is systolic pressure ≥140 mm Hg, or diastolic pressure ≥90 mm Hg, which is the same as the definition for the United States and WHO.

Definition of depression

Study subjects who had at least one diagnosis of depression (ICD-9-CM: 296.2, 296.3, 300.4 or 311) in 2005 for either outpatient or inpatient care were considered to have a diagnosis of depression.

Definition of diabetes

Study subjects who had at least one treatment prescription (oral hypoglycemic agents or insulin) of diabetes in 2005 for either outpatient or inpatient care were considered to have a diagnosis of diabetes.

Definition of hyperlipidemia

Study subjects who had a primary diagnosis of hyperlipidemia (ICD-9-CM: 272) identified in 2005 for either outpatient or inpatient care were considered to have a diagnosis of hyperlipidemia.

Prevalence of hypertension

For the prevalence of hypertension in the general population, the numerator was the number of cases of hypertension, and the denominator was the number of total study subjects in 2005. To calculate the prevalence of hypertension in patients with anxiety disorders, the numerator was the number of cases of hypertension among those patients with anxiety disorders, and the denominator was the number of total anxiety disorders subjects in 2005.

Incidence of hypertension

After we had calculated the prevalence of hypertension in patients with anxiety disorder and the general population, we had also followed 609,999 subjects without previous diagnosis of hypertension from 2006 to 2010. Subjects with newly diagnosed hypertension and no hypertension diagnosis before 2006 formed the group for incident hypertension. Namely, subjects with old hypertension diagnosis before 2006 were excluded in this incident study. Then, we calculated the incidence from 2006 to 2010. The numerator was the number of incident hypertension cases and the denominator was the number of person-years contributed by the study subjects.

Measures

Demographic factors were obtained directly from the individuals' files, including age, sex, antipsychotic use, antidepressant use, mood stabilizer use, insurance amount, region, and urbanicity. Age was divided into three categories: 18–39, 40–59, and ≥60 years. Antipsychotic use was grouped as without antipsychotic use, first-generation antipsychotic use, and second-generation antipsychotic use [18]. Antidepressant use and mood stabilizer use were defined as present or absent. The insurance