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Prevalence and neuro-psychiatric comorbidities of pediatric epilepsy in Taiwan: A national population-based study

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Abstract
Objective: Children with epilepsy may have comorbidities that result in significant disability. Epidemiological information for pediatric patients with epilepsy in Taiwan is scant. This research estimates the prevalence and common neuro-psychiatric comorbidities of children with epilepsy in Taiwan.
Methods: Patients aged less than 20 years old who had received a diagnosis of epilepsy and suffered from epileptic seizures in 2005 were identified in the NHIRD based on ICD-9-CM and prescription records for the use of at least one AED. We used cases of epileptic seizure to survey outpatient service data, and identify common neuro-psychiatric comorbidities. The crude prevalence rate and the age- and sex-specific prevalence were estimated. We also examined the effects of urbanization.
Results: The estimated prevalence of epilepsy was 0.33% in the pediatric population, with 0.29% for girls and 0.36% for boys. The most common neuropsychiatric comorbidities were learning disability and developmental delay, cerebral palsy, and mental retardation. Epilepsy was more prevalent in boys than in girls, especially among infants, preschool children, and those living in rural areas. In addition, boys with epilepsy had a higher rate of neurological comorbidities. The prevalence of psychiatric comorbidities was lower than that reported in previous studies performed in other countries, especially among children with epilepsy living in rural areas.

Abbreviations: NHIRD, National Health Insurance Research Database; ICD-9-CM, the diagnostic criteria of the International Classification of Diseases, Ninth Revision, Clinical Modification; NHRI, National Health Research Institute; AED, anti-epileptic drug; OR, odds ratio; CI, confidence interval; LDDD, learning disability and developmental delay; ADHD, attention-deficit hyperactivity disorder.

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Conclusion: This research provides the largest nationwide, population-based study of childhood epilepsy to estimate the prevalence and the associated neuropsychiatric comorbidities of pediatric epilepsy in Taiwan. Potential rural—urban disparity basing on prevalence and associated neuropsychiatric comorbidities cannot be ignored in Taiwan.

Introduction

Epilepsy, a neurological condition characterized by recurrent seizures, is one of the most highly prevalent pediatric neurological disorders and also a costly and complicated major public health problem (England et al., 2012). The epilepsy of a child influences the whole family system and leads to different burdens for the family members especially the parents. Studies reported increased stress and burden for families are particularly to be expected if the child shows additional emotional respectively behavioral problems or other comorbid conditions (Dehn et al., 2012; Hamiwka and Wirrell, 2009). Comorbidities refer to the co-occurrence of more than one condition in the same person. Generally, comorbidities are associated with poor health outcomes. It is now widely appreciated that comorbidities impact the quality of life in pediatric epilepsy and are evident at or prior to the onset of epilepsy (Lin et al., 2012).

Pediatric epilepsy patients have the greatest long-term morbidity, despite accounting for only approximately 20% of all patients newly diagnosed with a seizure disorder (Hauser, 1994). For healthcare providers, understanding the epidemiology and comorbidities of epilepsy in pediatric patients could help improve diagnosis, understand patient's prognosis, and widen insight of pathogenesis by revealing shared neurological mechanisms underlying multiple disorders that lead to contribution of information regarding available treatment choices.

In highly developed countries, prevalence estimations are relayed on available medical records and health care database. On the other hand, challenges in most developing countries are lack of national health care systems. Population-based studies with direct personal interviews through door-to-door or face-to-face survey remains the main tool for epidemiological studies (El-Tallawy et al., 2013; Ray et al., 2002; Shehata and Mahran, 2011; Snape et al., 2009). According to our survey, the prevalence of epilepsy has been conducted in local areas in Taiwan using door to door survey, however, both of them have focused mainly on adults (Chen et al., 2006a; Su et al., 1998). Population-based studies dealing specifically with children are few and suffer from difficulties with definitions and differences in methodology (Hauser, 1994; Hauser and Banerjee, 2008).

The National Health Insurance (NHI) program was implemented in Taiwan in 1995, and provides equitable, affordable, and universal health-care coverage to more than 98% of the 23 million residents of Taiwan (Chien et al., 2004, 2012). With such high cover rate, the claims data is suitable for epidemiology study. Currently, there are two studies, that using NHIRD for the prevalence and incidence of epilepsy. Hsieh et al. conducted a study using antiepileptic drug prescription data of NHIRD, and the prevalence of adult population in Taiwan of this study was 0.42% (Hsieh and Huang, 2008). However, the study excluded patients younger than 25 years old, that the results could not deliver any information for children. Another study had only one group of 0—19 subgroup and did not provide a detailed analysis for children and adolescents (Chen et al., 2012). Hence, epidemiological information regarding pediatric patients with epilepsy and the related comorbidities in Taiwan is scant.

In current research, we used NHI claims data from 2005 to determine the prevalence of epileptic seizures and epilepsy among children and adolescents. We also examined the rates of neuro-psychiatric comorbidities of the target subjects considering the effects of age, sex, and urbanization.

Materials and methods

Data source and sampling

We obtained the data for our study from the National Health Insurance Research Database (NHIRD), which is a subset of randomly selected NHI claims records. According to the National Health Research Institute (NHRI), which prepared and manages the NHIRD, the sampling randomization for the NHIRD used the linear congruential random number generation function of the Sun Work Shop C 5.0 (Chen et al., 2006b). The NHRI has reported no statistically significant difference in age, sex, or average household income exists between the NHIRD and the combined records of all NHI enrollees.

The NHI Bureau has approved the following 14 antiepileptic drugs (AEDs) for use by epilepsy patients in Taiwan: carbamazepine, phenytoin, gabapentin, clonazepam, clobazam, levetiracetam, oxcarbazepine, lamotrigine, primidone, tiagabine, topiramate, sodium valproate (valporic acid), vigabatrin, and phenobarbital. These AEDs were available in a total of 151 commercial forms in 2005.

Our study used 10 cohort datasets from the NHIRD. Each cohort included 40, 000 patients randomly sampled from all NHI beneficiaries in 2005. A total of 102,081 patients aged 20 years and younger were included in our analysis as of December 31, 2005, among whom 48,800 (47.8%) were females and 53,241 (52.3%) were males. Our study was approved by the Institutional Review Board of Kuang-Tien General Hospital.

Definition of epilepsy

For the purposes of our study, epileptic seizure was defined according to the diagnostic criteria of the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) as ICD-9-CM 345.xx for epilepsy and ICD-9-CM 780.3 and 790.39 for convulsion (Fisher et al., 2005; McAfee