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Adults with an epilepsy history, notably those 45–64 years old or at the lowest income levels, more often report heart disease than adults without an epilepsy history

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Abstract

From 95,196 sample adults in the combined 2010, 2013, and 2015 U.S. National Health Interview Survey, we estimated the association between histories of epilepsy and heart disease after accounting for sociodemographic characteristics and behavioral risk factors. Adults 18 years old or older with an epilepsy history reported heart disease (21%) about nine percentage points more often than those without such a history (12%), overall and within levels of characteristics and risk factors. These increases in heart disease history for adults with an epilepsy history compared with adults without such a history were greater in those 45–64 years old or at the lowest family income levels. These increases of heart disease in adults with an epilepsy history highlight two needs—to prevent the occurrence of heart disease and to reduce its consequences. Because comorbidity from heart disease can complicate epilepsy management, physicians caring for those with epilepsy should be aware of these increased risks, identify risk factors for heart disease, and recommend to their patients with epilepsy ways to diminish these risks.

Keywords

Heart disease; Epilepsy; Prevalence

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Conflict of interest statement

The authors have no conflicts of interest to report.

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1. Introduction

Comorbidity complicates the clinical course and the lives of persons with epilepsy [1, 2]. By itself, epilepsy may be difficult to treat, and multiple medications needed to control seizures may cause side effects. Adding another comorbid medical condition may only increase these problems—adding other medications with different and possibly interacting side effects with antiseizure medications and having to see more healthcare providers. Comorbidities may also increase the risk for early mortality in persons with epilepsy [3]. Heart disease is a common and serious cardiovascular comorbidity affecting persons with epilepsy [2, 4–8]. Heart disease may precede and cause epilepsy [9], and epilepsy may precede and cause heart disease [10]. These bidirectional effects may imply either different causal mechanisms or shared risk factors [2]. This report uses three recent population-based U.S. adult samples to estimate how often heart disease occurs in those reporting a history of epilepsy, overall and at different levels of demographic characteristics and heart disease risk factors.

2. Material and methods

Using nationally representative cross-sectional samples of the U.S. civilian, noninstitutionalized samples from the 2010, 2013, and 2015 cross-sectional National Health Interview Survey [11], we classified adults 18 years old or older as having a history of epilepsy if they had ever been told by a doctor or other health professionals that they had a seizure disorder or epilepsy. We further classified adults as having a history of heart disease if they had ever been told by a doctor or other health professionals that they had any of the following four conditions: coronary heart disease, angina pectoris, a heart attack, or any other heart condition. There were 95,196 respondents who answered questions about their epilepsy and heart disease status. Of the 1705 respondents reporting a history of epilepsy, 391 also reported heart disease; of the 93,491 respondents not reporting a history of epilepsy, 11,610 also reported heart disease. After accounting for the survey's complex design and weighting, we used logistic regression to estimate the prevalence of epilepsy by heart disease status and the percentages of heart disease in those with and without epilepsy (and differences in these percentages) overall and adjusted for levels of the following sociodemographic characteristics and behavioral risk factors: sex, age group, race–ethnicity, education, the ratio of family income to the poverty threshold, marital status, geographic region of residence, cigarette smoking status, body mass index, and hypertension history. We excluded from the analyses respondents who refused to answer or answered "Don't know" to any questions about histories of epilepsy (0.07%) and heart disease (0.17%) or to questions about the characteristics and risk factors (0.00% to 7.30%), except for family income, which was imputed for all respondents. We considered these percentages statistically significantly different at a two-tailed significance level of 0.05.

3. Results

In adults with heart disease, 3.1% also reported a history of epilepsy, 1.5% (95% confidence interval (CI) = 1.1%–2.0%) more than that in adults without heart disease (1.6%). In those without a history of epilepsy, the adjusted percentage of those reporting heart disease increased among men, adults 45 years old or older, non-Hispanic Whites, those who had not

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graduated from high school, those with family incomes less than 400% of the poverty threshold, former or current cigarette smokers, obese adults, and those with a history of hypertension (Supplemental Table). In adults with a history of epilepsy, however, these percentages did not vary as much, increasing only among adults 45 years old or older and those with a history of hypertension. Adults with a history of epilepsy overall reported a history of heart disease about 9 percentage points higher (21.0%) than adults without such a history (11.7%; difference = 9.3% [95% CI = 6.6%–12.0%]). This adjusted percentage in adults with a history of epilepsy significantly exceeded that in those without such a history at almost all levels of these sociodemographic and risk factor subgroups (Supplemental Table), with two of the largest excesses in adults 45–64 years old (14.1 percentage points) and adults with family incomes less than 100% of the poverty threshold (12.1 percentage points; Fig. 1).

4. Discussion

This study and other studies [2, 4–8] had identified heart disease as an important comorbidity for adults reporting a history of epilepsy or seizure disorder. Two of these studies also used similar questions in earlier U.S. National Health Interview Survey (during 2010 [4] and 2002 [6]) to ascertain comparable percentages of heart disease to those in this study for those with epilepsy (28% and 18%) and without epilepsy (13% and 11%). Other studies using surveys [5, 7] or administrative data [8] found generally similar greater risks of heart disease for those with epilepsy relative to the general population.

This current study not only adjusted for more socioeconomic characteristics and behavioral risk factors than other studies but also examined changes in the association between epilepsy and heart disease at different levels of these characteristics and risk factors. For example, even though the adjusted percentage of heart disease in those without a history of epilepsy increases directly with age, the largest difference (14.1%) in this adjusted percentage between those with a history of epilepsy (25.6%) and those without such a history (11.5%) occurred in those 45–64 years old, suggesting that heart disease may occur prematurely in those with a history of epilepsy. This study's other strengths included the availability of recent data, its large sample size leading to precise estimates, information on multiple characteristics for adjustment, and the representativeness of its sample of the U.S. adult population allowing generalizability.

This study also had several weaknesses. It relied on self-reported histories of the occurrence of epilepsy and seizure disorder and heart disease, making these reports subject to recall bias, social desirability bias, and misclassification. If a respondent misreported certain acute seizures or nonepileptic seizures as the recurrent unprovoked seizures typical of epilepsy, or if a respondent did not report epilepsy because of repercussions from its disclosure, the occurrence of epilepsy may be misclassified [1]. However, the question identifying adults with a history of epilepsy has a sensitivity of 84%, a specificity of 99%, and a positive predictive value of 74% [12]. Whether heart disease caused epilepsy or the reverse is impossible to determine because the survey is cross-sectional. Despite adjusting for multiple characteristics and risk factors, this study did not adjust for many other reported risk factors for heart disease or epilepsy so that some unobserved factors, therefore, could have caused

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both heart disease and epilepsy. Nonetheless, the observed differences in percentages of heart disease between those with a history of epilepsy and those without such a history are large. Thus, other unobserved risk factors would have to have been much more strongly associated with both epilepsy and heart disease to account for these large differences. Comparing the percentages of heart disease in those with epilepsy vs. those without epilepsy as ratios (relative risks) rather than differences would have provided a different perspective on the results; however, this latter relative perspective can be misleading in conveying the size of risk [13].

These increases of heart disease in adults with an epilepsy history highlight two needs—to prevent the occurrence of heart disease and to reduce its consequences. Because comorbidity from heart disease can complicate epilepsy management, physicians caring for those with epilepsy should be aware of these increased risks, identify risk factors for heart disease, and recommend to their patients with epilepsy ways to diminish these risks.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.yebeh.2018.05.021.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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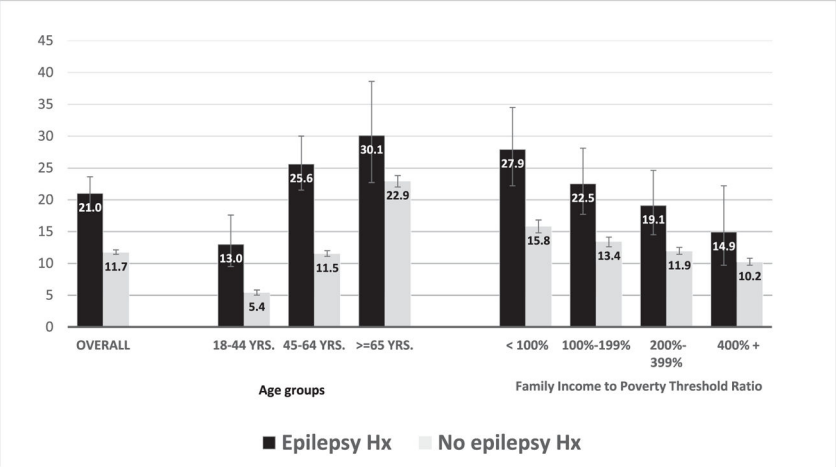

Fig. 1.

Percentages of adults with and without an epilepsy history reporting doctor-diagnosed heart disease (i.e., coronary heart disease, angina pectoris, a heart attack, or any other heart condition) overall and by age group and family income to poverty thresholds in the 2010, 2013, and 2015 National Health Interview Survey.