Comorbidity of Adult People with Epilepsy in Thailand

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Background: There have been no previous studies about comorbidities among adult people with epilepsy in Thailand.

Objective: To identify the most common comorbid condition among adult people with epilepsy in Thailand.

Materials and Methods: The present study retrospectively explored Thai national data for reimbursements related to comorbidities among epileptic patients 18 years of age or older who were admitted for care between the fiscal years 2004 to 2012. People with epilepsy were searched for and identified using the ICD-10 code (G40) from the national database maintained by the Universal Health Coverage Insurance Office. Comorbid diseases were explored among eligible patients.

Results: Among the 139,867 adult people with epilepsy found, the top five most common comorbid conditions were hypertensive disease (10%), diabetes mellitus (4.6%), traumatic brain injury (2.8%), stroke (2.3%), and psychosis (1.9%).

Conclusion: Hypertension was the most common comorbid condition among adult people with epilepsy in Thailand. Therefore, outside of previous attention on neurologic or psychiatric comorbid conditions, this study provides new and interesting information concerning comorbidities in epilepsy and useful data for planning care of people with epilepsy in the future.

Keywords: Comorbidity, Adult people with epilepsy, Thailand

Epilepsy is a chronic neurological disorder that is a major public health problem widely affecting all ages, races, societies, and countries. The burden of epilepsy is high, accounting for 0.5% of the overall burden of diseases in the world in the year 2000[1]. Worldwide, there are about 50 million epilepsy patients, 85% of whom are living in developing countries[2]. Generally, patients with epilepsy who have good seizure control can live a normal life. On the other hand, epileptic patients with comorbidities, such as depression, migraines, or psychiatric comorbidities, are associated with poor seizure outcomes because of the comorbidities' effects on epilepsy prognosis and quality of life[3]. Among adults with epilepsy in the United States, the net association of epilepsy with days of role impairment after controlling for comorbidities is equivalent to an annualized 89.4 million excess role impairment days[4]. The burden of comorbidity in people with epilepsy is high[5]. Currently, there have been a limited number of studies on comorbidities among adult people with epilepsy. Many studies on neurologic comorbidities, particularly psychiatric[6] and non-psychiatric comorbid conditions have been conducted abroad[7]. However, there are relatively few studies on other types of comorbid conditions in epilepsy. A search for data in Thailand conducted prior to this study revealed that no research on comorbidities in epilepsy had been studied and available yet. Therefore, the researcher deemed this study a useful step in establishing a database for further study and development in future research.

Materials and Methods
Study design

The present study was designed to retrospectively explore national data collected by the Universal Health Coverage Insurance office. The study examined data from the fiscal year 2004 to 2012. Data studied were collected from the reimbursement section and included data regarding all admitted epilepsy patients equal to or more than 18 years of age. The ICD-10 code (G40) was used to identify eligible patients. Medical discharge forms were used to retrieve clinical data, information on comorbid diseases, and patients' discharge status.

Discharge statuses of all admitted patients were defined by attending physicians according to four levels:

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complete recovery, improved, unimproved, and death. In the present study, the first two categories were classified as an improved or good outcome, while the latter two were classified as an unimproved or poor outcome. All eligible patients were divided into one of two groups: good or poor outcome.

Universal Health Coverage Insurance is the main healthcare insurance system in Thailand and is supported by the government. This healthcare insurance covers approximately 75% of the entire Thai population. The other two healthcare insurance systems in Thailand are the social security system and the Civil Servant Medical Benefits system. A person can have only one type of healthcare insurance.

Statistical analysis

Descriptive statistics were used to study baseline characteristics and to detect significant differences between the two discharge statuses of either a good or poor outcome. Student's t-test was used for comparison of the group mean values expressed as continuous variables. A Chi-squared test was used to compare categorical variables between groups. All data analyses were performed with STATA software version 10 (College station, Texas, USA) on a personal computer. A p-value less than 0.05 was considered statistically significant.

Results
Demographics

During the 9-year study period, there were 139,867 adults with epilepsy admitted. Most patients were male (92,972 cases; 66.47%), and most were in the range of 18 to 29 years of age (34,602 cases; 24.74%) followed by 30 to 39 years of age (32,294 cases; 23.09%) and 40 to 49 years of age (29,967 cases; 21.43%), as shown in Table 1.

Outcomes of treatment

According to the patients' discharge status, 92.9% of patients had improved (with 0.6% categorized as complete recovery), 6.0% had not-improved, and the in-hospital mortality rate for adult patients with epilepsy was 0.5%, as shown in Table 1.

The top five most common comorbid conditions in patients with epilepsy were hypertension (10%), diabetes mellitus (4.6%), traumatic brain injury (2.8%), stroke (2.3%), and psychosis (1.9%), as shown in Table 2.

The findings show that for adult people with epilepsy assigned a discharge status of not-improved/death (poor outcome) (n = 9,108), sex was an associated factor. Male patients were more likely than female patients to have a poor outcome (64.8% vs. 35.2%). The 3 most common comorbid conditions leading to a poor outcome were hypertension (9.8%), diabetes mellitus (5.5%), and stroke (3.0%), and the 2 most common complications leading to a poor outcome were septicemia (3.8%) and pneumonia (3.5%), as shown in Table 3.

Out of the 14 comorbid conditions, 9 of them were

Table 1. Demographic data and discharge statuses of adults with epilepsy admitted for care throughout Thailand during the 9-year study period from 2004 to 2012

Variables	n (%)
Sex	
Male	92,972 (66.47)
Female	46,895 (33.53)
Age admitted (in years)	
18 to 29	34,602 (24.74)
30 to 39	32,294 (23.09)
40 to 49	29,967 (21.43)
50 to 59	19,251 (13.76)
60 to 69	12,460 (8.91)
70 to 79	8,347 (5.97)
80+	2,946 (2.11)
Discharge status	
Complete recovery	829 (0.60)
Improved	129,930 (92.90)
Not-improved	8,452 (6.00)
Dead	656 (0.50)

Table 2. Comorbidities and complications in adults with epilepsy admitted for care throughout Thailand during the 9-year study period from 2004 to 2012

Comorbidity/Complication	n (%)
Comorbidity	
Hypertension	13,950 (10.0)
Diabetes mellitus	6,471 (4.6)
Traumatic brain injury	3,875 (2.8)
Stroke	3,252 (2.3)
Psychosis	2,654 (1.9)
Alcoholism	1,992 (1.4)
Schizophrenia	1,832 (1.3)
Chronic renal failure	1,547 (1.1)
Brain tumor	683 (0.5)
Depression	578 (0.4)
Cirrhosis	512 (0.4)
Central nervous system infection	403 (0.3)
Subdural hematoma	182 (0.1)
Epidural hematoma	23 (0.02)
Complication	
Urinary tract infection	2,091 (1.5)
Pneumonia	1,484 (1.1)
Septicemia	909 (0.6)
Pressure sore	479 (0.3)
Shock	246 (0.2)

associated significantly with poor outcomes. Additionally, 4 complications were signifcant factors leading to poor outcomes, as shown in Table 3.

Discussion

Our 9-year longitudinal national data on adult

Table 3. Factors affecting discharge status of adults with epilepsy admitted for care throughout Thailand during the 9-year study period from 2004 to 2012

Variables	Discharge status of adults with epilepsy (n = 139,867)		*p*-value
	Good outcomes (n = 130,759) n (%)	Poor outcomes (n = 9,108) n (%)	
Sex			
Male	87,069 (66.59)	5,903 (64.81)	0.001
Female	43,690 (33.41)	3,205 (35.19)	
Age admission (year)			
18 to 29	32,558 (24.90)	2,044 (22.44)	
30 to 39	30,184 (23.08)	2,110 (23.17)	<0.001
40 to 49	28,114 (21.50)	1,853 (20.34)	
50 to 59	18,063 (13.81)	1,188 (13.04)	
60 to 69	11,574 (8.85)	886 (9.73)	
70 to 79	7,634 (5.84)	713 (7.83)	
80+	2,632 (2.01)	314 (3.45)	
Diabetes mellitus	5,968 (4.56)	503 (5.52)	<0.001
Hypertension	13,060 (9.99)	890 (9.77)	0.506
Chronic renal failure	1,348 (1.03)	199 (2.18)	<0.001
Cirrhosis	451 (0.34)	61 (0.67)	<0.001
Alcoholism	1,827 (1.40)	165 (1.81)	0.001
Psychosis	2,411 (1.84)	243 (2.7)	0.001
Stroke	2,983 (2.28)	269 (2.95)	<0.001
Central nervous system infection	356 (0.27)	47 (0.52)	<0.001
Traumatic brain injury	3,622 (2.77)	253 (2.78)	0.965
Brain tumor	620 (0.47)	63 (0.69)	0.004
Subdural hematoma	176 (0.13)	6 (0.07)	0.079
Epidural hematoma	21 (0.02)	2 (0.02)	0.671
Depression	541 (0.41)	37 (0.41)	0.914
Schizophrenia	1,674 (1.28)	158 (1.73)	<0.001
Septicemia	563 (0.43)	346 (3.80)	<0.001
Pneumonia	1,163 (0.89)	321 (3.52)	<0.001
Pressure sore	414 (0.32)	65 (0.71)	<0.001
Urinary tract infection	1,935 (1.48)	156 (1.71)	0.076
Shock	167 (0.13)	79 (0.87)	<0.001

people with epilepsy admitted for care show that the most common comorbid of epilepsy was hypertension, followed by diabetes mellitus. These findings differ from a previous study conducted in Thailand by Phabphal et al[8] on comorbidities of epilepsy in elderly people, which found that depression and anxiety were the most common comorbidities, followed by sleep-related disorders and stroke. Gaitatzis et al[9] found that the most common comorbidities of epilepsy were depression (30%), followed by anxiety disorders (10 to 25%) and psychoses (2 to 7%).

      The authors analyzed the data in terms of the discharge statuses assigned to adult people with epilepsy, isolating those who were given an unimproved/death (poor outcome) status in order to explore the comorbidities that led to poor outcomes in adult people with epilepsy (*p*-value <0.05). The present study showed that comorbidities leading to an unimproved/death (poor outcome) discharge status in adult people with epilepsy were diabetes mellitus, chronic renal failure, cirrhosis, alcoholism, psychosis, stroke, central nervous system (CNS) infection, brain tumor, and schizophrenia. There were 4 complications that were signifcant factors leading to poor outcomes, including septicemia, pneumonia, pressure sore, and shock. Our findings also show that a factor affecting the discharge status for adult people with epilepsy who were assigned an unimproved/ death (poor outcome) status was sex, with males being more likely to have a poor outcome than females (64.8% vs. 35.2%). The various comorbidities associated with epilepsy may be either a result of the epilepsy itself causing the comorbidity or the comorbidity may be causing the epilepsy. For example, chronic renal failure can cause epilepsy, e.g. uremic encephalopathy[10]. In addition, stroke[11], CNS infection[12], and brain tumors[13] can cause seizures or epilepsy due to the pathology of the brain. On the other hand, epilepsy itself can also cause various diseases, such as psychosis[6], schizophrenia, and so on.

      Liver and kidney diseases are comorbidities often associated with epilepsy and are interesting in the way they can affect the determination of medication for treatment[14]. The data we obtained and examined showed that alcoholism

can be considered a common comorbidity, as it ranked 6th with a rate of 1.4%. On the other hand, if the alcoholism rate is combined with cirrhosis, liver disease as a comorbidity associated with epilepsy increases to 1.8%. This would place liver disease as the 6th most common comorbidity associated with epilepsy, after psychosis (1.9%). Another interesting comorbidity, as previously mentioned, is chronic renal failure, which was found to be the 8th most common comorbidity of epilepsy with a rate of 1.1%. Liver and kidney diseases are important for determining treatment due to limitations of several anticonvulsants when treating epileptic patients with poor liver or kidney function. Most such antiepileptic drugs are older, and there are new anticonvulsants today that can be used with good outcomes in patients with liver and kidney diseases[14,15]. Therefore, this information is useful in administering anticonvulsants to emergency patients. Occasionally, or in some hospitals, blood cannot be sent for urgent testing of liver and kidney function, e.g. in some community hospitals, or it is not possible to know the underlying diseases of patients showing symptoms of epilepsy. A good and safe solution may be to consider the use of new antiepileptic drugs.

Most previous research has focused on comorbidities of epilepsy in terms of behavior and psychosis[6,9]. Based on the research data collected in the present study, psychosis is associated with epilepsy, but it is only ranked the 5th most common comorbidity (1.9%) among the total population studied and the 5th (2.7%) in patients assigned a status of unimproved/death (poor outcome). This shows that in Thailand a number of other comorbidities are associated with epilepsy and are more common than psychosis. Therefore, an initiation of research exploring comorbidities in terms other than behavior and psychosis would be interesting.

A comparison was done of the findings from this research with other studies of the same nature that have investigated comorbidities in epilepsy. The results from one such study are shown in Table 4.

A comparison of the results from previous research in the United States, with the findings from the present study, shows both similarities and differences regarding the comorbidities found in people with epilepsy. The most common comorbidity in both studies was hypertension. The results of other rankings are different, as shown in Table 4. The findings from the two studies may not be directly comparable, because while the topic of the present study is comorbidities, it is meant to be suitable for research and practical use in Thailand. Thus, it may be that the setting of comorbidities in Thailand is inconsistent with the setting of comorbidities in the United States. The data and analysis in the present study provide a preliminary overview of comorbidities of epilepsy in Thailand only. Therefore, further research is still needed to maximize the benefits, e.g. the correlation between epilepsy and comorbidities, etc.

Strengths of the study

The present study is a collection of historical data

Table 4. Percentage of adults with selected non-psychiatric conditions, by epilepsy status National Health Interview Survey, United States, 2010[7]

Comorbidities	Numbers (%)
Pain or stiffness in a joint	257 (47.5)
Low back pain	219 (40.1)
Hypertension	194 (34.2)
Arthritis	180 (30.9)
Severe headache or migraine	174 (34.7)
Neck pain	143 (25.7)
Sciatica	124 (58.3)
Any heart disease	98 (18.3)
Sinusitis	86 (15.6)
Dermatitis	83 (17.5)
Facial ache or pain in the jaw	73 (14.2)
Stroke	72 (14.3)
Cancer	62 (11.3)
Diabetes mellitus	58 (10.4)
Liver condition	18 (3.0)

The table shown is only a section of the table found in the original reference[7]

over a long period of time (9 years) and with a large number of research participants. Moreover, the data collected meets Thailand's ICD-10 standard, thus making the data obtained highly reliable. The data can be used as a database for further education, or this research data can be used for immediate reference.

Limitations

This data was collected from hospitals across Thailand. Thus, the diagnoses and identification of comorbidities are dependent on the treatment provided by physicians. The physicians providing diagnoses were neurologists, medical specialists, or general practitioners in some hospitals. Patients with unclear symptoms may sometimes require specialists in particular areas of medicine to achieve an accurate diagnosis. After physicians have provided a diagnosis, the person recording the ICD-10 might be a physician, nurse, or public health official. For this reason, data obtained may include some discrepancies. Additionally, the diagnoses did not include a specification of the type of epilepsy. As a result, it was not possible to identify clearly the type of epilepsy directly associated with each of the comorbidities. In addition, this research included inpatients only, excluding outpatients. Therefore, there might have been a change in comorbidity rankings in epileptic patients if the outpatients had been included in the study. Another limitation, since some comorbidities are associated specifically with severe epilepsy, was that the severity of epilepsy was not specified in the diagnosis. At the same time, some comorbidities may not be related to the severity of epilepsy. The correlation between comorbidities and the severity of epilepsy cannot yet be established by the present study.

Conclusion

The present study found that the most common comorbidity of adult people with epilepsy in Thailand is hypertension. Thus, apart from current research on comorbidities that focuses on neurological or psychiatric problems, the present study shows evidence of other diseases associated with epilepsy which have been diagnosed frequently in recent years. Therefore, the findings from the present study are useful for further research.

What is already known on this topic?

Epilepsy is the most common neurological disease.

What this study adds?

Most common comorbidity in adult people with epilepsy in Thailand is hypertension that affect to treatment outcome of adult people with epilepsy.

Potential conflicts of interest

The authors declare no conflicts of interest.

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โรคที่พบร่วมในผู้ป่วยผู้ใหญ่โรคลมชักในประเทศไทย

สินีนาฏ พรานบุญ, สมศักดิ์ เทียมเก่า, ธนพล อุฬณาวรงค์, แก้วใจ เทพสุธรรมรัตน์, กิตติศักดิ์ สวรรยาวิสุทธิ์ และในนามกลุ่มวิจัยโรคลมชักแบบบูรณาการ มหาวิทยาลัยขอนแก่น

ภูมิหลัง: ที่ผ่านมายังไม่มีการศึกษาเกี่ยวกับโรคที่พบร่วมในผู้ป่วยผู้ใหญ่โรคลมชักในประเทศไทย

วัตถุประสงค์: เพื่อศึกษาโรคที่พบร่วมในผู้ป่วยผู้ใหญ่โรคลมชักในประเทศไทย

วัสดุและวิธีการ: การศึกษาแบบเก็บข้อมูลย้อนหลัง โดยใช้ฐานข้อมูลของประเทศจากการสรุปเวชระเบียนเพื่อเบิกจ่ายค่ารักษาพยาบาลจากสำนักงานหลักประกันสุขภาพแห่งชาติ ของผู้ป่วยที่ได้รับการวินิจฉัยด้วยโรคลมชัก โดยสืบค้นจากรหัสโรค ICD-10 (G40) ในผู้ป่วยมีอายุ 18 ปี ขึ้นไป ที่นอนรักษาในโรงพยาบาล ตั้งแต่ ปี พ.ศ. 2547 ถึง 2555

ผลการศึกษา: ผู้ป่วยผู้ใหญ่โรคลมชักมีทั้งหมด 139,867 คน โรคที่พบร่วมกับโรคลมชักสูงสุด 5 อันดับแรก ได้แก่ โรคความดันโลหิตสูง (ร้อยละ 10), โรคเบาหวาน (ร้อยละ 4.6), การได้รับบาดเจ็บที่ศีรษะ (ร้อยละ 2.8), โรคหลอดเลือดสมอง (ร้อยละ 2.3) และจิตเภท (ร้อยละ 1.9)

สรุป: โรคความดันโลหิตสูงเป็นโรคที่พบร่วมกับโรคลมชักมากที่สุดในผู้ป่วยผู้ใหญ่โรคลมชักในประเทศไทย ดังนั้นนอกจากจะให้ความสนใจโรคร่วมทางด้านระบบประสาท หรือโรคร่วมทางด้านจิตเวชแล้ว การศึกษานี้ยังเป็นการค้นพบข้อมูลใหม่ที่น่าสนใจเกี่ยวกับโรคที่พบร่วมกับโรคลมชักและเป็นข้อมูลที่เป็นประโยชน์ในการวางแผนการดูแลผู้ป่วยโรคลมชักต่อไป