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# A prevalence study of epilepsy in Hong Kong

## 癲癇症在香港的患病率的研究

**Objectives.** To examine epidemiological data on epilepsy for the Hong Kong west region.

**Design.** Descriptive study.

**Setting.** Epilepsy clinic, university teaching hospital, Hong Kong.

**Patients and methods.** The epilepsy clinic of Queen Mary Hospital manages the majority of adult patients (aged 15 years or older) with chronic seizure disorders resident in the Hong Kong west area with an adult population of 475 900. All patients underwent electroencephalography examination and each subject was independently assessed by two epileptologists for diagnosis and classified according to the International League Against Epilepsy recommendations.

**Results.** Seven hundred and thirty-six patients (female, 42.9%; male, 57.1%; mean age, 40.8 years; standard deviation, 13.6 years) with epilepsy were enrolled in the study. The prevalence rate of active epilepsy in the population 15 years or older was estimated at 1.54 per 1000 on 1 January 2002. Two hundred and eighty-five (38.7%) patients had idiopathic epilepsy syndromes, 100 (13.6%) had cryptogenic epilepsy, and 285 (38.7%) had a remote symptomatic aetiology. Seizure type was partial in 408 (55.4%) patients and generalised in 285 (38.7%). Thirty-one (4.2%) patients had a positive family history. Idiopathic generalised epilepsy syndromes described as common in the literature, such as juvenile myoclonic epilepsy and childhood absence epilepsy, were infrequently seen at 0.68% and 0.95% of cases, respectively.

**Conclusions.** This study provides baseline data for epilepsy service development and research in Hong Kong. The prevalence rate of active epilepsy in this Chinese, adult population was low compared with that reported in other developed countries. Further population-based epidemiological research is indicated to confirm the prevalence of seizure disorders in this locality.

**Key words:**

Epilepsy;  
Hong Kong;  
Prevalence;  
Seizures

**關鍵詞:**

癲癇症;  
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**目的:** 檢視香港島西區癲癇症的流行病學數據。

**設計:** 描述研究。

**安排:** 香港一所大學教學醫院的癲癇科診所。

**患者及方法:** 瑪麗醫院癲癇科診所處理港島西區大部分患有癲癇症的成年人(15歲或以上);該區成年人口為475 900人。所有患者均接受腦電描記術檢查,並由兩位癲癇症專家分別評估,並按國際抗癲癇聯盟的建議進行分類。

**結果:** 共有 736 位癲癇症患者參與本研究(女性佔 42.9%, 男性佔 57.1%; 平均年齡: 40.8 歲; 標準差: 13.6 歲)。以 2002 年 1 月 1 日的數據估計, 15 歲或以上的人口中癲癇症患病的比率為每 1000 人 1.54。研究對象中, 285 人(38.7%)有自發性癲癇症候群, 100 人(13.6%)患上隱原性癲癇症, 285 人(38.7%)為間接的症狀性癲癇症病因。按發作類型來劃分, 局部發作的有 408 人(55.4%), 全身發作的佔 285 人(38.7%)。31 位病者(4.2%)的家族中有成員患有癲癇症。文獻中被認為常見的自發性全身癲癇症候群, 如青年肌陣攣癲癇和孩童期失神癲癇, 在本研究的病例中甚為罕見, 分別只佔 0.68% 和 0.95%。

**結論:** 本研究為香港的癲癇症醫療服務發展和研究提供了基本數據。與其他發達國家公佈的數據比較, 本地的華人成年人口中, 癲癇症患病的比率相對較低。至於本地的癲癇紊亂患病率的高低, 需要進一步進行以人口為基礎的流行病學研究才能確定。

## Introduction

Epilepsy is a common neurological disorder.<sup>1</sup> It is the most common neurological disease worldwide, and the second most common neurological disease in the developed world second to stroke. An estimated 45 to 100 million people worldwide suffer from active epilepsy.<sup>2</sup> The prevalence and incidence of epilepsy varies across countries, however. Epidemiological data are crucial for physicians and health care administrators planning management of patients with chronic diseases, such as epilepsy. We report a clinic-based epidemiological study of patients with epilepsy, living in the urban locality of Hong Kong west (HKW).

## Methods

### Study population

The study population included all current patients of the epilepsy clinic at Queen Mary Hospital (QMH) on 1 January 2002. The epilepsy clinic at QMH is responsible for patients with chronic seizure disorders living in the HKW region, which hosts an adult population (aged 15 years or older) of 475 900.<sup>3</sup> More than 97.8% of this population are ethnic Chinese. In Hong Kong, about 93.6% of the general population receive a public (socialised) medical health service.<sup>3</sup> Clinic patients are referred from general practitioners, private neurologists, accident and emergency departments, and on discharge from in-patient services. The HKW neurological service has operated a catchment system for its clinics since 1996. Patients' demographic data are screened, and patients residing outside the QMH clinic catchment area are advised, and referred to the neurological service nearest their residential address. Thus, on 1 January 2002, the majority of neurological patients seen at the QMH epilepsy clinic were living in the HKW region.

### Inclusion and exclusion criteria

Patients who were residents of the catchment area and who had experienced two or more unprovoked seizures were included in the study. Patients with an uncertain diagnosis, non-epileptic seizures, those who failed to attend follow-up for more than 1 year, and those who had moved from the QMH clinic catchment area were excluded.

### Investigation procedures and diagnoses

All patients underwent interictal electroencephalography (EEG) examination, with both awake and asleep tracings obtained whenever possible. Four hundred and forty-two neuroimaging studies (63 computed tomography and 379 magnetic resonance imaging brain scans) were performed for 372 patients. In selected cases, video-EEG, functional neuroimaging studies, urine metabolic screening, and neuropsychological assessment were also completed to reach a precise diagnosis. All patients and investigation results were assessed by two epileptologists independently, and then a consensus diagnosis was reached.

## Definitions

Definitions from the International League Against Epilepsy (ILAE) Commission on Classification and Terminology and the Commission on Epidemiology and Prognosis were used.<sup>4-6</sup> A prevalent case of active epilepsy was defined as a person with epilepsy who had experienced at least one seizure in the previous 5 years, regardless of antiepileptic drug treatment.<sup>7</sup> Of note, cases with epilepsy in remission requiring no medication were normally seen for regular follow-up at the epilepsy clinic for at least 5 years. Classification of seizure type was made according to the revised International Classification of Epileptic Seizures.<sup>4</sup> This classification is based on seizure description, EEG, and other available investigation results. Aetiology was defined according to the epidemiological standards set forth by the ILAE.<sup>6</sup> Idiopathic epilepsy was reserved for patients with certain partial or generalised epileptic syndromes with particular clinical characteristics and specific EEG findings. Remote symptomatic epilepsy referred to epilepsy in the presence of a static neurological abnormality, a history of brain insult, cerebrovascular disease, or a disorder associated with an increased risk of epilepsy presumed to be aetiologically related to the patient's epilepsy. Cryptogenic epilepsy referred to epilepsy in which no factor associated with increased risk of seizure could be identified as the underlying aetiology, and the form of epilepsy was not one of the specific idiopathic syndromes.<sup>7</sup>

### Statistical analysis

Differences between patients according to epilepsy and seizure type were assessed by the Student's *t* test. Statistical significance was defined as  $P < 0.05$ . The Statistical Package for the Social Sciences (Windows version 11.0; SPSS Inc., Chicago, US) was used for statistical analysis.

## Results

Seven hundred and thirty-six patients (316 [42.9%] females and 420 [57.1%] males; age range, 17-88 years; mean age, 40.8 years; standard deviation [SD], 13.6 years) were included in the study. All had chronic active epilepsy, and had visited the epilepsy clinic at least once in 2001. Therefore, the derived prevalence rate of active epilepsy in the catchment population 15 years or older was 1.54 per 1000 on 1 January 2002. Prevalence rates peaked at the age of 25 to 30 years and then gradually decreased. The data are presented graphically in the Fig.

### Epilepsy type and aetiology

Two hundred and eighty-five (38.7%) patients had idiopathic epilepsy syndromes, 100 (13.6%) patients were classified as cryptogenic cases, and 285 (38.7%) patients had remote symptomatic epilepsy. Aetiological structural abnormalities could be identified in 231 (81.1%) patients with remote symptomatic epilepsy. Causes included arteriovenous malformation ( $n=14$ ), cavernous angioma ( $n=6$ ), neuronal migration disorders ( $n=12$ ), cerebral infarct ( $n=40$ ), hippocampal sclerosis ( $n=47$ ), and focal cerebral atrophy ( $n=23$ ).

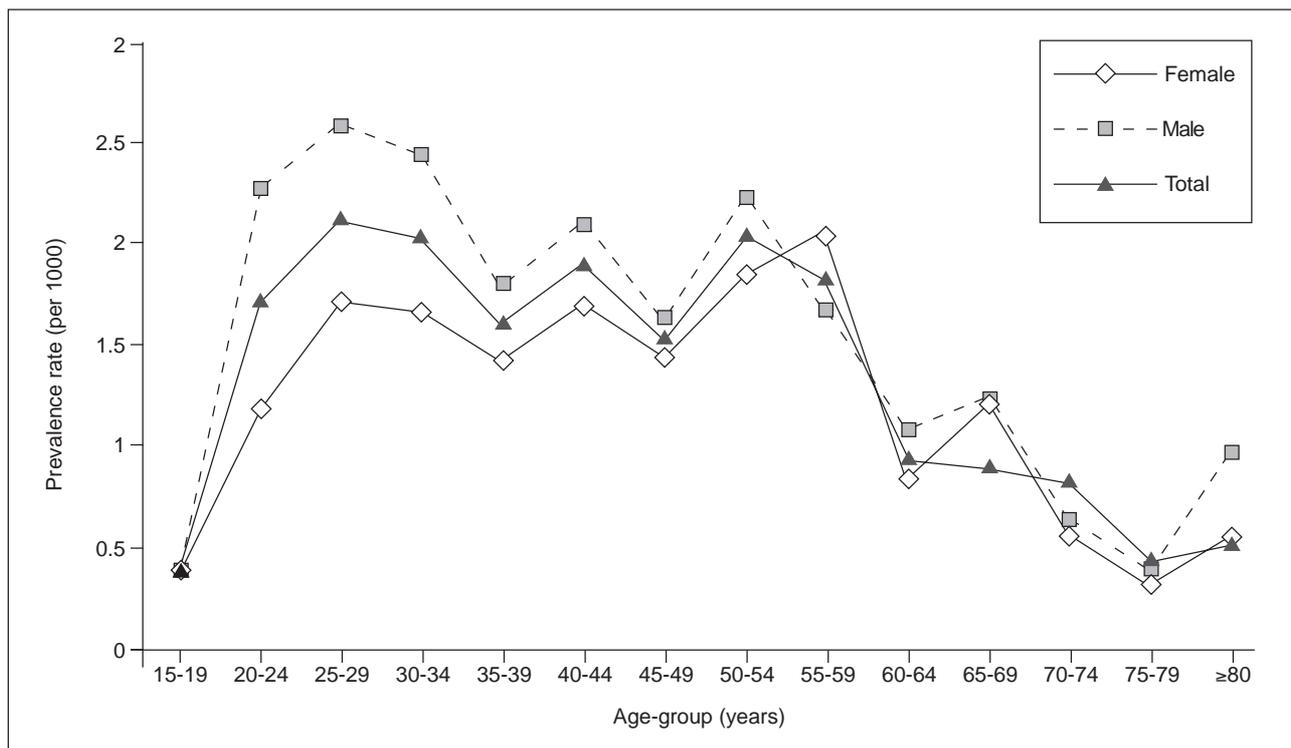


Fig. Prevalence of chronic active epilepsy according to age and sex

### Seizure types and epileptic syndromes

Seizure type by sex, epilepsy type, and aetiology by age are shown in Tables 1 to 3. Seizure type was partial in 408 (55.4%), generalised in 285 (38.7%), and unclassifiable in 43 (5.8%) patients. Generalised tonic-clonic seizures and partial seizures with secondary generalisation were the most common seizure types. The Student's *t* test showed a significant difference between the mean age of patients with idiopathic epilepsy (36.69 years; SD, 12.89 years), cryptogenic (38.27 years; SD, 10.25 years), and remote symptomatic (42.85 years; SD, 14.26 years) epilepsies ( $P < 0.001$ ).

### Family history

Thirty-one (4.2%) patients reported a history of seizure disorders in parents, siblings, or offspring. Idiopathic generalised epilepsy occurred in 24 (77.4%) patients with a family history of epilepsy. Partial seizure occurred in the remaining seven (22.6%) patients—five (16.1%) with temporal lobe epilepsy, one (3.2%) with frontal lobe epilepsy, and one (3.2%) with partial epilepsy with variable focus. Among patients with idiopathic generalised epilepsy, two patients with juvenile myoclonic epilepsy (JME) and five patients with childhood absence epilepsy (CAE) were identified. Detailed assessment of other patients with idiopathic generalised epilepsy with generalised tonic-clonic convulsion did not reveal features suggestive of JME or CAE.<sup>8</sup>

### Age at seizure onset

Mean age at the onset of epilepsy was 19.94 years (range, 1-72 years). The mean age at onset for idiopathic, cryptogenic, and remote symptomatic epilepsy were 18.91 (SD, 11.42), 19.90 (SD, 9.91), and 20.63 (SD, 14.28) years, re-

spectively. There was no statistically significant difference found between the groups with respect to age at onset.

### Discussion

We report an epidemiological study of epilepsy in Hong Kong, with data derived from an epilepsy clinic serving a population of 475 900. The age-adjusted average annual incidence of epilepsy has been variously reported in the literature as from 28.9 to 53.1 cases per 100 000 population.<sup>9-13</sup> Generalised onset seizure represents 39% to 59% of cases, while partial seizure accounts for 32% to 52%.<sup>10,11,13</sup> The cumulative incidence of epilepsy reported is between 1.3%<sup>14</sup> and 3.1%<sup>15</sup> up to the age of 80 years, with a bimodal distribution. The first incidence peak has been noted to occur before 20 years, while the second peak occurs after 60 years.<sup>10</sup> The reported prevalence of epilepsy varies from 2.7 to 41.3 per 1000.<sup>10,12,13,16-25</sup> Age-specific prevalence peaks in varying age-groups in different studies. This is a likely consequence of methodological differences and socio-economic constituents of different populations.<sup>2</sup>

Although population-based and hypothesis-driven epidemiological studies are preferable,<sup>7</sup> conflicting epidemiological studies in Chinese populations<sup>26-29</sup> indicated a need to review local epidemiological data. Under the current health care system, the Hospital Authority in Hong Kong manages more than 93.6% of the population requiring medical care.<sup>3</sup> Further, having actively discharged patients with neurological disorders not in our catchment area, and taken referrals from other regional hospitals, the pool of patients in this study would have represented the vast

**Table 1. Sex distribution and prevalence rate for different seizure types**

	Female, n=316		Male, n=420		Total, n=736	
	No. (%)	Rate*	No. (%)	Rate*	No. (%)	Rate*
Generalised seizure	121 (38.3)	0.51	164 (39.0)	0.69	285 (38.7)	0.60
Partial seizure	177 (56.0)	0.74	231 (55.0)	0.97	408 (55.4)	0.86

\* Prevalence rate per 1000

**Table 2. Type of epilepsy by patient age**

Type of epilepsy	Age-group (years)			Total
	15-39	40-59	≥60	
Idiopathic (%)	63.80	29.90	6.30	100
Remote symptomatic (%)	45.30	41.50	13.20	100
Cryptogenic (%)	58.00	40.00	2.00	100

**Table 3. Age distribution of aetiological diagnosis for localisation-related epilepsies**

Aetiological diagnosis	Age-group (years)			Total
	15-39	40-59	≥60	
Intracranial infection (%)	55.50	44.50	0.00	100
Cerebral vascular disease (%)	25.00	41.70	33.30	100
Cranial trauma (%)	41.10	47.10	11.80	100
Perinatal insults (%)	50.00	33.30	16.70	100
Congenital malformation (%)	36.40	54.60	9.00	100
Intracranial neoplasm (%)	50.10	33.30	16.80	100
Hippocampal sclerosis (%)	43.50	52.10	4.30	100
Degenerative brain disease (%)	55.00	39.00	6.0	100

majority of patients with chronic epilepsy residing in the QMH catchment area. Despite this, a number of cases could have been missed because in Hong Kong, general practitioners, geriatricians, psychiatrists, and neurosurgeons also manage patients with seizure disorders. For example, some cases under the care of geriatricians or neurosurgeons, with good seizure control may be managed without referral to our clinic. This may explain the missing second prevalence peak reported after the age of 60 years elsewhere.<sup>10</sup> In addition, a small but unknown proportion of patients with seizure disorder were receiving traditional Chinese medicine. We incidentally noted a few patients taking herbal medicine monotherapy for their seizure disorders. A study in Taiwan showed that about 16% of patients with seizure disorders took herbal medicine as an "add-on" therapy, in addition to antiepileptic drugs.<sup>30</sup> Other cases omitted from our study may have included individuals unaware of their epilepsy and not receiving medical care, as well as those who may not want to seek medical attention due to concern about possible prejudices towards people with epilepsy.<sup>31</sup>

There were 475 900 adults aged 15 years or older living in the HKW region at the time of the study. Based on our data, the point prevalence of active epilepsy in the present study is 1.54 per 1000. Even taking into account the possibility of 7% underreporting of epilepsy due to using medical record as a source of information as suggested by Haerer et al,<sup>22</sup> our figure is low compared with other reported prevalence rates worldwide. This could reflect inadequate enrolment of patients with seizure disorder at the prevalence date, and thus, the derived prevalence may underestimate the true prevalence rate.

To date, only a few epidemiological surveys of epilepsy among Chinese populations are available.<sup>26,27</sup> Li et al<sup>26</sup> re-

ported a lifetime prevalence of 4.4 cases per 1000 in the urban areas of China. Considering the epidemiological data of epilepsy throughout the world, prevalence rates were intermediate in white population studies in the US and Europe and were low in the Asian population, based on other studies performed in India and Japan.<sup>23,32,33</sup> Although the low estimated prevalence in our study could be due to underreporting as a consequence of denial of illness secondary to the psychosocial stress associated with epilepsy,<sup>31,34,35</sup> two other Hong Kong-based epidemiological studies reported a similar prevalence rate for epilepsy at 0.45 and 1.52 per 1000, respectively.<sup>28,29</sup> The projected number of patients with epilepsy in Hong Kong based on these rates would be 3150 and 10 780, respectively, for a territory-wide population of 7 million.<sup>36</sup>

The aetiological classification of epilepsy in this study revealed idiopathic epilepsy in 38.7% of patients, cryptogenic epilepsy in 13.6%, and remote symptomatic epilepsy in 38.7%. These proportions are comparable with other studies reported worldwide. However, they differ from the Hong Kong data reported by Ng et al<sup>29</sup> who found only 3.9% of cases had idiopathic epilepsy, 59.9% cryptogenic epilepsy, and 35.1% remote symptomatic epilepsy. In the current study, we were able to classify 91% of epilepsies and syndromes according to current ILAE classification system. The proportions of patients with partial seizures and generalised seizures were 55.4% and 38.8%, respectively. The most frequent seizure subtypes were partial seizures with secondary generalisation, which was followed by complex partial seizure and generalised tonic-clonic seizure. There was no significant difference seen between the sexes. There are discrepancies between the current study and the data reported by Ng et al,<sup>29</sup> who found 80.7% of patients had generalised tonic-clonic seizures, and 28.3% of patients

**Table 4. Epidemiological data reported on epilepsy for populations in China**

	Current study	Kwong et al <sup>28</sup>	Ng et al <sup>29</sup>	Li et al <sup>26</sup>
Prevalence date	1 January 2002	1 July 1997	Mid-1997	1 January 1983
Population age-group studied (years)	15-87	0-15	10-95	0-70
Prevalence (per 1000)	1.54	1.52	0.45	4.4
Generalised tonic-clonic seizure (%)	38.8	37	80.7	81
Secondary generalised tonic-clonic seizure (%)	53	27	NA*	NA
Partial seizure (%)	55.4	49	28.3	4.8
Idiopathic epilepsy (%)	38.7	42	3.9	NA
Cryptogenic epilepsy (%)	13.6	17	59.9	NA
Remote symptomatic epilepsy (%)	38.7	41	35.1	NA

\* NA not applicable

complex partial seizures. Similar observations were made by Li et al<sup>26</sup> in the case series reported in 1985. The differences could possibly reflect differences in the design of questionnaires used, the extensiveness of diagnostic evaluation, advances in diagnostic tests and genetic knowledge, and inappropriate application of the ILAE classification and misclassification of non-epileptic patients as having a generalised seizure disorder. Nevertheless, whether partial or generalised seizures predominate in epilepsy remains controversial.<sup>37-41</sup> The trend with respect to the predominance of partial seizure in the adult patients reported in this study was also observed in the epidemiological data reported by Kwong et al.<sup>28</sup> They found that 64% of children aged 5 years or less suffered from generalised seizures compared with 41% of the older group studied. Epidemiological findings from four studies conducted in China are summarised in Table 4.

Identification of familial epilepsy cases is crucial to further molecular genetic research into epilepsy. The QMH epilepsy clinic actively searched for familial cases of epilepsy. Interestingly, our data showed a huge discrepancy from western data with respect to idiopathic generalised epilepsy, in particular, JME and CAE, the two most common idiopathic forms of epilepsy with a definite genetic basis.<sup>42,43</sup> It has been estimated that JME accounts for 10% to 30% of all epilepsies.<sup>44</sup> Childhood absence epilepsies with or without grand mal account for another 5% to 15% of all epilepsies.<sup>8,45</sup> Our observations are consistent with those reported by Kwong et al,<sup>28</sup> who identified three cases of CAE and one case of JME from a cohort of 309 paediatric patients. In the present study, only five patients with JME and seven patients with CAE were identified. A positive family history could be found in only two patients with JME and five patients with CAE. Considering the study population as a whole, this means 0.68% and 0.95% of all subjects with active epilepsy had JME and CAE, respectively. Among the 31 patients with a positive family history, the most prevalent form of idiopathic epilepsy syndrome was idiopathic generalised epilepsy, with generalised tonic-clonic seizure (48.38%). This major discrepancy between western data and local data could possibly reflect ethnic differences in genetic constitution.<sup>36</sup>

## Conclusion

The epidemiological data for patients with active epilepsy

resident within a defined geographic area of Hong Kong was analysed. The prevalence rate of active epilepsy in this Chinese, adult population was low compared with that reported in other developed countries. A larger, population-based, epidemiological study is indicated to confirm the findings of this study.

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