Epilepsy in Children and Adolescents

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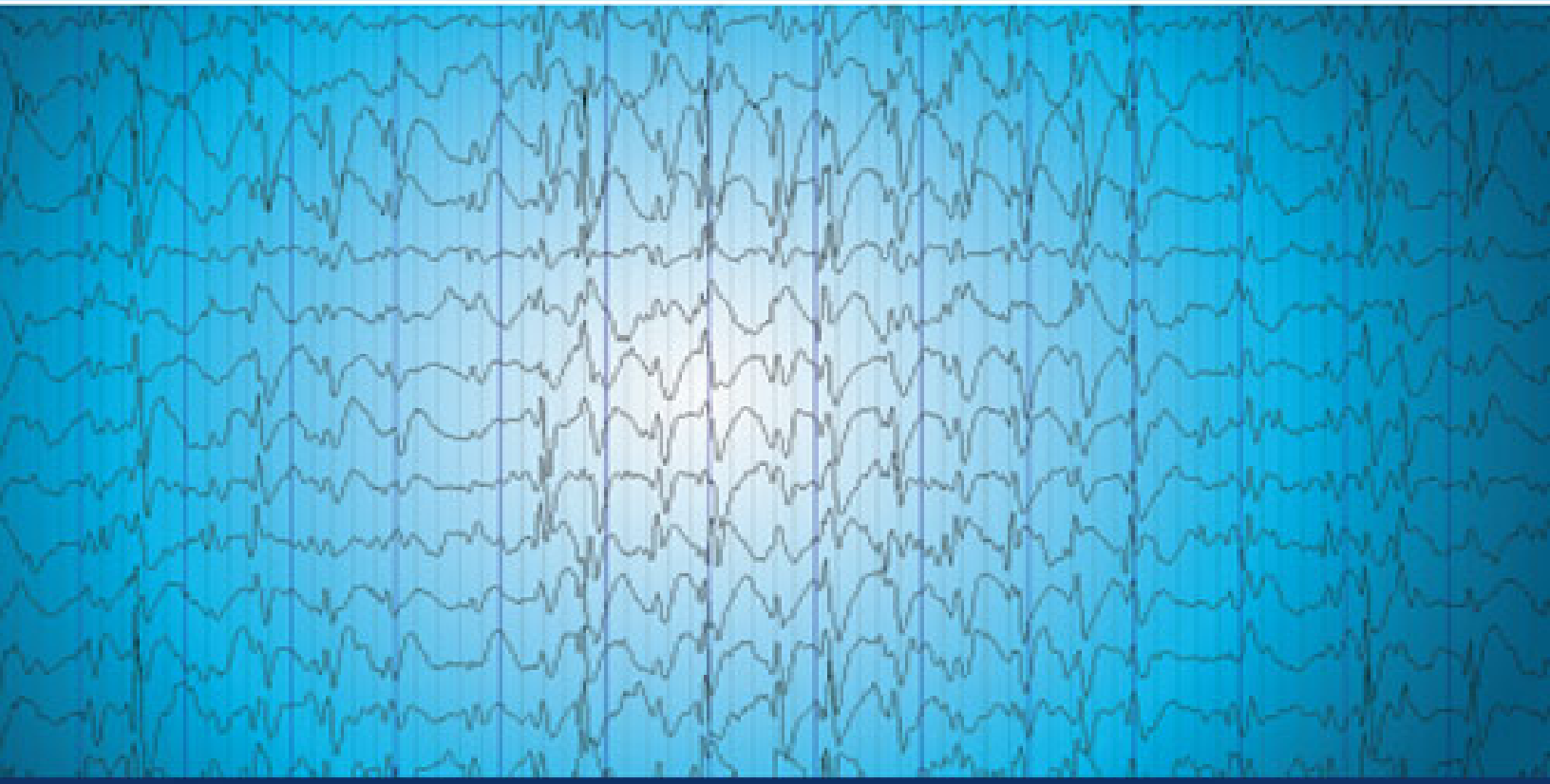

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Preface

Of all the neurological disorders that affect infants, children, and adolescents, epilepsy is a profound challenge for the patients, caregivers, and physicians and demands expertise to evaluate and treat. As with every illness, gathering a clinical history is an important first step in helping define the problem. However, remarkable improvements in our ability to image brain structures, define physiological patterns, and select medications has made the task of caring for the child with epilepsy more effective than in past years. I envision this book to be a resource for all physicians and other professionals taking care of children with seizures or epilepsy. The goal was for each chapter to be succint, so a physician confronted with a child who has seizures would have an efficient resource for answering questions and designing treatment. I thank the authors for their focus and persistence. I am ever mindful of the patients and their families who bear the challenge of epilepsy with courage. I have learned from them and am keenly aware of our responsibility to do the very best for their care.

James W. Wheless
Memphis, TN, USA
June, 2012

Section 1

Epidemiology and classification of childhood epilepsies

Phillip L. Pearl

1

Epidemiology and common comorbidities of epilepsy in childhood

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Epilepsy is a common illness in childhood, and the epidemiology has been well described. However, epilepsy is also complex and controversial in terms of optimal methods for diagnosis and treatment. Classification schemes for seizures have been refined over the years and improved treatment options have allowed better outcomes for children with epilepsy. Understanding of comorbidity, particularly psychiatric comorbidity, has also improved over recent years, yet in many cases it is difficult to resolve whether psychiatric illness is coincidental or associated with the underlying seizure disorder. This chapter addresses the incidence and prevalence of childhood epilepsy and strategies for identifying and managing common psychiatric comorbidities.

1.1 Epidemiology

An epileptic seizure is defined as the clinical manifestation of abnormal or excessive discharge of neurons in the brain [1]. Epilepsy is defined as recurrent seizures, specifically two or more seizures separated by 24 hours but within 18 months of one another [1,2]. This common consensus is based on observations that children who experience one seizure have an approximately 50% chance of recurrence within 2 years [3,4]. It is important to note that febrile seizures are not included in most epidemiological studies of epilepsy.

Population-based studies concerning seizures and epilepsy have been done in numerous communities around the world. Although many international studies of prevalence are based on small communities, the results can be extrapolated to reflect wider regions of the world. In the United States, there are approximately 2.3 million people diagnosed with epilepsy, which reflects an incidence of approximately 1% of the population [5]. The pediatric population, however, has a higher prevalence of epilepsy; 4–10% of children will experience a seizure before the age of 16. Thus, a working knowledge of epilepsy is very important for primary and specialty clinicians in pediatrics, as well as for pediatric neurologists [6].

Terminology review

Incidence: The rate at which new cases of disease occur in a population during a given period of time.

Prevalence: The proportion of a population who have a disease during a given time period.

1.2 Incidence and prevalence

In the general population, the incidence of epilepsy is reported at between 40 and 70 cases per 100 000 [7]. The incidence of childhood epilepsy has been reported to be

82.2 per 100 000 children, markedly higher than that of the overall population [8]. A meta-analysis of over 40 epidemiological studies found that the highest incidence of epilepsy occurs in childhood and in the geriatric population. Interestingly, the incidence of epilepsy has been decreasing over the past 50 years. This decrease in incidence could be explained by more stringent and/or universally followed diagnostic criteria or perhaps from a decrease in exposure to epilepsy risk factors [8].

The overall number of children affected by epilepsy, or the prevalence of the disease, is higher than the incidence because of the chronic nature of epilepsy. A significant variation in prevalence is found in international epidemiology studies [9-12]. In the United States, epilepsy prevalence averages 3.83 per 1000 children, while in northern Tanzania, it is 7.39 per 1000 [13,14]. This discrepancy may result from a variety of factors including possible misclassification of a single seizure as epilepsy. Environmental factors, access to healthcare, and different methods of reporting may also account for some of the variability. The prevalence of epilepsy in varying regions across the world is described in Table 1.1.

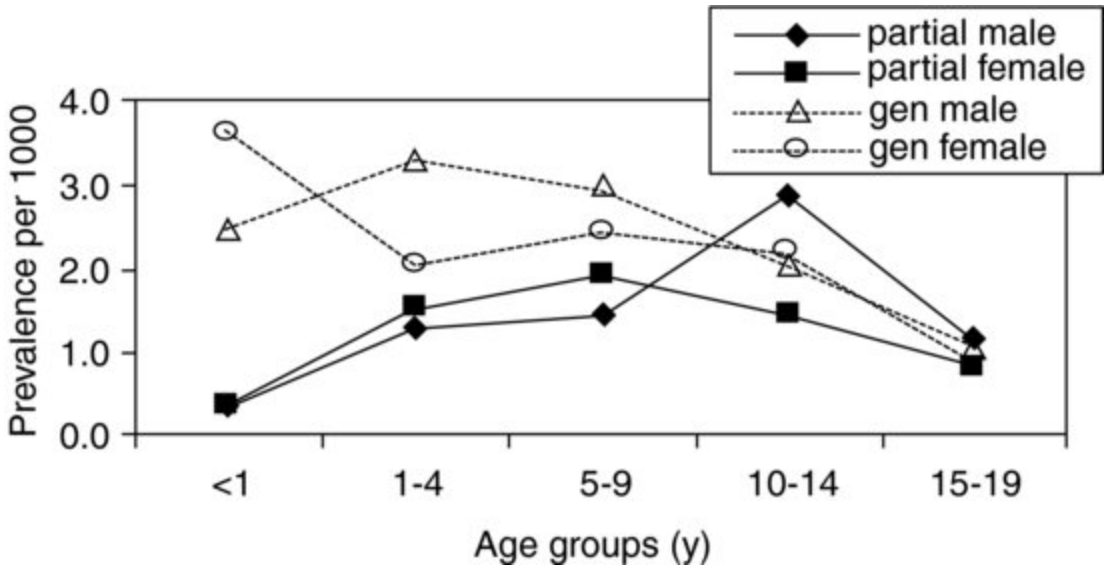
Table 1.1 International epidemiology studies.

Location	Years of study	Epilepsy prevalence	Age range	Limits/comments
Okayama Prefecture, Japan [9]	1999	5.3 per 1000	0–12 years	Removed data resulting from only one seizure
Kayenta, Shiprock, and Crowpoint Reservations, Navajo Nation, USA [10]	1999–2002	6.46 per 1000	0–19 years	Only those who went to hospital; excluded those who used tribal medicine
Hordaland count, western Norway [12]	1995	5.13 per 1000	6–12 years	Small sample area, limited age range
Northern Tanzania (14)	2003–2004	7.39 per 1000	0–19 years	Only villages polled around centralized hospital location
Rochester, Minnesota [13]	1950–1980	3.83 per 1000	0–14 years	Very comprehensive
Estonia [15,16]	1995–1997	3.7 per 1000	0–19 years	Much of data came from one hospital, University of Tartu
Canada [17]	1994–2001	2.5 per 1000	0–11 years	Utilized national census data
		4.4 per 1000	12–14 years	

1.3 Gender and age

Studies have consistently found that males are diagnosed with epilepsy more often than females [18]. While the difference between the genders is slight, this trend holds true for most populations [13]. Although there are exceptions to this trend, they are rarely statistically significant in children [10,11]. Analysis of prevalence among children of varying ages found that epilepsy was most common in children under the age of 5, with a gradual decline in occurrence in older age groups [15]. Figure 1.1 demonstrates the peak of prevalence at a young age and a gradual decrease in children as they age.

FIGURE 1.1 Graph showing prevalence of epilepsy (per 1000) in children by year from age 1 to 19 [16].

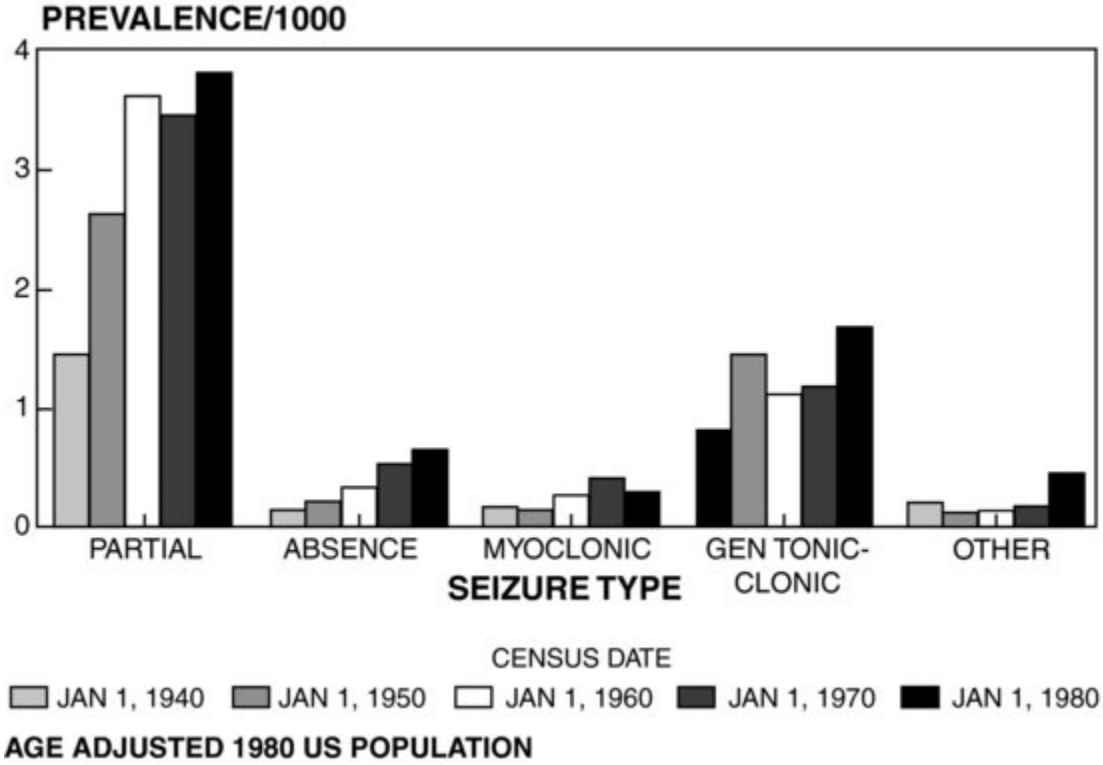


1.4 Classification

When studying the epidemiology of epilepsy, means of classification must be clarified to ensure uniformity in standards. Since 1909, the International League Against Epilepsy (ILAE) has worked toward identifying, studying, and classifying all variations of seizure disorders. Epilepsy syndromes can be classified as localization-related or generalized. The syndromes are determined by multiple criteria, with particular emphasis on seizure type as well as associated patient characteristics such as age of onset, comorbidities including neurodevelopmental status, presence of associated family history, and identification of an underlying etiology [1]. Distinguishing characteristics of seizure types can range from loss or modification of consciousness and responsiveness, along with total or partial motor control impairment [2].

A 40-year detailed study done in Rochester, Minnesota, found that partial seizures are the most prevalent, followed by generalized tonic-clonic, absence, and then myoclonic. Details for prevalence are represented in Figure 1.2 [13].

FIGURE 1.2 Bar graph of relative prevalence of adolescent seizure etiologies (per 1000) [13].



1.5 Febrile seizures

Febrile seizures are a common seizure disorder for children under the age of 3 years. Between 2% and 4% of children will suffer from one febrile seizure, and only one-third of these children will have a second seizure [18]. Most importantly, a febrile seizure will not always lead to epilepsy. Between 2% and 10% of children who experience one febrile seizure will develop epilepsy [19].

1.6 Etiology

Most cases of epilepsy are of unknown etiology [12]. Recent guidelines have identified three main classifications of epilepsy etiologies: Genetic, metabolic/structural, and idiopathic/unknown [2]. Genetic disorders include diseases

due to a known genetic defect in which seizures are the main manifestation of the disease. Seizures of metabolic/structural etiology can be those epilepsies attributed to lesions, which are often a result of head trauma, central nervous system (CNS) infection, or tumor [4]. Epilepsy of unknown etiology represents the most common designation for epilepsy in childhood.

1.7 Psychiatric comorbidity

Psychiatric and psychological complications are commonly associated with pediatric epilepsy [20-23]. In pediatrics, the classic Isle of Wight epidemiology study reports psychiatric illness present in 16% of patients with chronic medical illness; however, if that illness happened to be epilepsy, the psychiatric comorbidity was 29% [24]. Subsequent studies have confirmed an overrepresentation of psychiatric illness associated with epilepsy as compared to many other chronic medical illnesses. Some studies report a two- or three-fold greater prevalence of psychiatric illness associated with epilepsy as compared to diabetes or asthma [25,26]. Of particular concern is evidence showing an overrepresentation of epilepsy among children and adolescents hospitalized for suicide attempts [27]. Despite numerous reports confirming high levels of comorbidity, many children and adolescents with epilepsy do not receive treatment for psychiatric illness [28]. In many cases, the psychiatric comorbidity may be more impairing to quality of life for children and families than the seizures themselves [29].

This consistently high level of psychiatric comorbidity suggests that epilepsy is a complicated illness that may have neuropsychiatric symptoms well beyond discrete seizures. However, the etiology of psychiatric comorbidity in children and adolescents with epilepsy is still controversial.