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Prevalence of pediatric epilepsy in low-income rural Midwestern counties

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ABSTRACT

Epilepsy is one of the most common disabling neurological disorders, but significant gaps exist in our knowledge about childhood epilepsy in rural populations. The present study assessed the prevalence of pediatric epilepsy in nine low-income rural counties in the Midwestern United States overall and by gender, age, etiology, seizure type, and syndrome. Multiple sources of case identification were used, including medical records, schools, community agencies, and family interviews. The prevalence of active epilepsy was 5.0/1000. Prevalence was 5.1/1000 in males and 5.0/1000 in females. Differences by age group and gender were not statistically significant. Future research should focus on methods of increasing study participation in rural communities, particularly those in which research studies are rare.

Prevalence of epilepsy in rural Kansas study group.

Participating institutions	Location
Ashley Clinic	Chanute, KS
Coffeyville Regional Medical Center	Coffeyville, KS
Labette Health	Parsons, KS
Mercy Hospital	Independence, KS
Mercy Clinic	Independence, KS
Mt. Carmel Hospital	Pittsburg, KS
St. John's Regional Medical Center	Joplin, MO
University of Kansas Medical Center (KUMC)	Kansas City, KS
KUMC—Area Health Education Center (AHEC)	Pittsburg, KS
Parsons State Hospital	Parsons, KS
Community Health Center of Southeast Kansas	Pittsburg, KS
Via Christi Health	Wichita, KS
Children's Mercy Hospital	Kansas City, MO
University of Oklahoma Medical Center	Oklahoma City, OK

Participating practitioners	Location
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1. Introduction

Epilepsy, a neurological condition characterized by recurrent unprovoked seizures, affects an estimated 2.2 million people in the United States and 65 million worldwide and is most often manifest in childhood and older adults [1]. At present, information is lacking about prevalence and etiology of epilepsy in pediatric rural populations in the United States [1].

Different methodologies and sources of cases can affect the measured prevalence of active epilepsy [2]. Past studies of pediatric epilepsy prevalence have involved the collection of cases from retrospective chart reviews [3–5], door to door surveys [6–8], questionnaires administered through primary care offices [9], and random samples of a community [10]. The latter method identified a very high prevalence, especially for children aged 0–4 years (65.4/1000) [10], whereas studies using door to door surveys [8] and hospital chart abstraction [11] have identified pediatric epilepsy prevalence to be as low as 3.8/1000 and 3.4/1000, respectively.

Epilepsy prevalence might be affected by population demographics as well as by methodology. Past prevalence studies conducted in rural areas of the United States have generally reported higher prevalence than studies using similar definitions performed in urban populations [12–14]. However, race and SES may be confounding factors. While epilepsy prevalence has generally been shown to be higher in minority communities when compared with Caucasian communities, the separate impact of socioeconomic status (SES) has seldom been assessed, particularly in a pediatric population.

In studies not specific to pediatric populations, low SES has long been associated with increased prevalence of epilepsy [15,16]. This phenomenon was first observed in cross-sectional studies, where it was impossible to determine whether low SES was a risk factor or a consequence of the disorder. More recently, two population-based studies have shown that low SES is associated with an increased incidence of epilepsy [17,18]. This may be partially related to the increased prevalence of risk factors for epilepsy in those of lower SES, but associations held even in those for whom etiology was unknown [18].

We undertook a study of the prevalence of active epilepsy in children in a rural, predominantly Caucasian, low SES population in southeastern Kansas. The population was selected to determine prevalence in a low SES rural community while limiting confounding by race and ethnicity.

2. Material and methods

2.1. Definitions and factors examined

Epilepsy was defined according to the guidelines of the Commission on Epidemiology and Prognosis, International League Against Epilepsy [ILAE], as a condition characterized by two or more unprovoked seizures at least 24 h apart [19–21]. Active epilepsy was defined as having a diagnosis of epilepsy and having at least one seizure or taking antiepileptic drugs (AEDs) in the past five years through 2009.

2.1.1. Etiology of epilepsy

Etiology of epilepsy was classified as idiopathic/cryptogenic, remote symptomatic, progressive symptomatic, other rare categories that did not fit the prior three etiologies, or unknown [19–22]. Etiology was classified as unknown when etiology information was not present in the medical record.

2.1.2. Seizure type

Seizure type was classified as primary generalized, partial with secondary generalization, partial without generalization, both partial and generalized, unclassifiable whether partial or generalized, or unknown [23].

2.1.3. Syndrome

Syndrome was classified according to the 1989 ILAE Commission on Classification and Terminology as idiopathic generalized epilepsy, cryptogenic or symptomatic generalized epilepsies, localization-related epilepsy, epilepsy with both generalized and localization-related features, no definitive features of partial or generalized epilepsies, or unknown when insufficient information was available to allow classification [22].

2.2. Participants and site participation for data collection

2.2.1. Ethical approval

The study protocol was approved by the University of Kansas and University of Kansas School of Medicine—Wichita Human Subjects Committees, Columbia University Institutional Review Board, and institutional review boards at all participating sites.

Table 1
Prevalence of active epilepsy in nine rural Kansas counties by demographics and epilepsy features.

	N (%)	Base population N (%)	Prevalence per 1000 (95% C.I.)[a]
Total	216 (100%)	42,897 (100%)	5.0 (4.4, 5.7)
Sex[b]			
Male	112 (51.9%)	22,002 (51.3%)	5.1 (4.6, 5.6)
Female	104 (48.1%)	20,895 (48.7%)	5.0 (4.5, 5.5)
Age groups			
0–4	40 (18.5%)	11,500 (25.0%)	3.5 (2.4, 4.6)
5–9	62 (28.7%)	11,030 (24.0%)	5.6 (4.2, 7.0)
10–14	68 (31.4%)	10,920 (23.8%)	6.2 (4.7, 7.7)
15–18	46 (21.3%)	9447 (20.5%)	4.9 (3.5, 6.3)
County[c]			
Allen	12 (5.6%)	3193 (7.4%)	3.8 (1.6, 5.9)
Bourbon	14 (6.5%)	3953 (9.2%)	3.5 (1.7, 5.4)
Cherokee	14 (6.5%)	5356 (12.5%)	2.6 (1.2, 4.0)
Crawford	48 (22.2%)	9164 (21.4%)	5.2 (3.8, 6.7)
Labette	40 (18.5%)	5527 (12.9%)	7.2 (5.0, 9.5)
Montgomery	43 (19.9%)	8631 (20.1%)	5.0 (3.5, 6.5)
Neosho	26 (12.0%)	4100 (9.6%)	6.3 (3.9, 8.8)
Wilson	11 (5.1%)	2363 (5.5%)	4.7 (1.9, 7.4)
Woodson	4 (1.9%)	610 (1.4%)	6.6 (0.1, 13.0)
Etiology			
Idiopathic/cryptogenic	114 (52.8%)	42,897 (100%)	2.7 (2.2, 3.1)
Remote symptomatic	50 (23.2%)	42,897 (100%)	1.2 (0.8, 1.5)
Progressive symptomatic	3 (1.4%)	42,897 (100%)	0.1 (0.0, 0.1)
Other	15 (6.9%)	42,897 (100%)	0.3 (0.2, 0.5)
Unknown	34 (15.7%)	42,897 (100%)	0.8 (0.5, 1.1)
Seizure type			
Primary generalized seizures	25 (11.6%)	42,897 (100%)	0.6 (0.4, 0.8)
Partial with secondary generalization	47 (21.8%)	42,897 (100%)	1.1 (0.8, 1.4)
Partial without generalization	22 (10.2%)	42,897 (100%)	0.5 (0.3, 0.7)
Both partial and generalized	3 (1.4%)	42,897 (100%)	0.1 (0.0, 0.1)
Unclassifiable, whether partial or generalized	49 (22.7%)	42,897 (100%)	1.1 (0.8, 1.5)
Unknown	70 (32.4%)	42,897 (100%)	1.6 (1.2, 2.0)
Syndrome			
Idiopathic generalized	24 (11.1%)	42,897 (100%)	0.6 (0.3, 0.8)
Cryptogenic or symptomatic generalized epilepsies	14 (6.5%)	42,897 (100%)	0.3 (0.2, 0.5)
Localization-related epilepsies[d]	84 (38.9%)	42,897 (100%)	2.0 (1.5, 2.4)
Both partial and generalized epilepsies	9 (4.2%)	42,897 (100%)	0.2 (0.1, 0.3)
No definitive features of partial or generalized epilepsy	56 (25.9%)	42,897 (100%)	1.3 (1.0, 1.6)
Unknown	29 (13.4%)	42,897 (100%)	0.7 (0.4, 0.9)

[a] For calculation of confidence interval of county, etiology, seizure type, and syndrome specific prevalence, Poisson distribution on count was assumed.
[b] For gender specific confidence interval, assumed binomial distribution with expected mean calculated from census data.
[c] Two cases missing county information.
[d] Idiopathic localization-related epilepsy, cryptogenic localization-related epilepsies, symptomatic localization-related epilepsies, and localization-related epilepsies with uncertainty about whether they are cryptogenic or symptomatic.