

Epidemiology of active epilepsy in a suburban community in Southeast Nigeria: A door-to-door survey

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Abstract

Context: Epilepsy is one of the most common neurologic conditions afflicting an estimated 65 million people the world over. Current community-based data on the prevalence of active epilepsy in Africa are sparse.

Aims: This study was aimed at determining the prevalence and profile of active epilepsy in a suburban community in Southeast Nigeria.

Methods: It was a two phase cross-sectional descriptive study. In the first phase, those with possible active epilepsy were identified in a door-to-door survey using a modification of the World Health Organization Neuroscience research protocol. In the second phase, cases of active epilepsy were identified and the clinical forms of epilepsy diagnosed based on the International League against Epilepsy guidelines 1993.

Results: A total of 6,800 persons was screened in the first phase of the study. There were 29 cases (16 males and 13 females) of active epilepsy. The point prevalence of active epilepsy was 4.3/1,000 (95% confidence interval (95% CI): 2.7-5.9) for the total population, 4.9/1,000 (95% CI: 2.5-7.3) for males and 3.7/1,000 (95% CI: 1.7-5.7) for females. The age-adjusted prevalence for the total population was 4.1/1,000 (US Population 2000). Classified using clinical criteria only, generalized seizures occurred in 62.1% ($n = 18$) while partial seizures occurred in 37.9% ($n = 11$) of cases.

Conclusions: The prevalence of active epilepsy in Southeast Nigeria is comparable to that found in developed and some developing countries but less than that reported in suburban Southwest Nigeria about three decades ago.

Key words: Active epilepsy, prevalence, profile

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Introduction

Epilepsy is one of the most common neurologic conditions in the world.^[1] It is estimated that there are at least 65 million people living with epilepsy in the world with most residing in developing countries.^[2] The prevalence of lifetime epilepsy differs (and is higher) from that of active epilepsy.^[2] An active prevalence case is one that continues to experience the burden of epilepsy based either on recency of seizure (generally in the year prior to the prevalence date or within 5 years of the prevalence date,

depending on the study) and/or recency of anti-seizure medication use.^[3]

Lower epilepsy prevalence is reported in developed regions (United States and Europe) in comparison to developing regions (Latin America and Africa), with Asia reporting the lowest frequency of epilepsy.^[3] The prevalence of epilepsy ranges from 3.3 to 6.8/1,000 in

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Europe and North America,^[3,4] 5.1–57.0/1,000 in Latin America,^[5] 4.3–74.4/1,000 in sub-Saharan Africa,^[6,7] and 2.4–10.7/1,000 in Asia.^[8]

Data on the prevalence of epilepsy in Nigeria are sparse especially that of active epilepsy with most available data dating back to about 3 decades ago. The prevalence of epilepsy from Nigerian studies is 37/1,000 and 5.3/1,000 in Aiyete and Igbo-Ora both in Southwest Nigeria,^[9,10] and 6.2/1,000 in Udo, South-south Nigeria.^[11] Beside these studies conducted several years ago, a more recent Nigerian study, reported a prevalence of active epilepsy of 20.8/1,000 and 4.7/1,000 in Izzi, rural Southeast Nigeria and Ogobia, semi-rural North-central Nigeria respectively.^[12,13] The need for these current large scale community-based prevalence studies of active epilepsy in Nigeria informed this present study. Our study was aimed at providing current data on the prevalence and profile of active epilepsy in a suburban, South-eastern Nigerian community.

Methods

Study location

The study was conducted in Ukpo headquarters of Dunukofia Local Government area of Anambra state, Southeast Nigeria. Dunukofia Local Government area has a population of 96,517 and 20,708 households by ownership status of dwelling units according to the 2006 population census.^[14] Ukpo was chosen for the ease of conducting a door-to-door survey in the area. Several community-based studies have been conducted in the area in the past as it hosts one of the Community Medicine outstations of the Nnamdi Azikiwe University Teaching Hospital (NAUTH). Unlike the cities in Nigeria, the population Ukpo is relatively stable with fewer migrants to the area since there are no industries or large government establishments attracting people to the area. Ukpo is inhabited predominantly by the Igbo speaking people who are the major ethnic group inhabiting the south-eastern part of the country. The population is predominantly agrarian, the people practice subsistence farming also included by few civil servants under the local government employment. Christianity is the major religion with a few adherents of Africa traditional religions. The later minority group had retained practices rooted in the traditions and with cultural beliefs of the people. The diet of the people is tuber based with moderate cereal and large consumption of palm oil. Existing health facilities in Ukpo include the NAUTH Health Center that commenced in 1997. This center also accommodates the Neuroepidemiology center of the Department of Medicine, NAUTH. Before this time, the center had existed as a community hospital in the defunct Eastern region of Nigeria. The other health facilities in Ukpo are the Dunukofia Local Government Health center and two maternity homes.

The survey

It was a two phase cross-sectional descriptive study. The phases were preceded by sensitization meetings with the community leaders and training workshops for the research assistants. A census of households in the area was conducted 3 weeks prior to the study. This was to ascertain the stability of the population and to determine its major characteristics and the average number of persons per household so as to enable appropriate representative sample of the population to be selected. The number of households interviewed was based on the average number of 4.7 persons per household obtained from the census to give the estimated minimum sample size of 6,800 persons. Households were listed according to their family names, and a total of 1,700 households interviewed were selected using computer generated random numbers.

The first phase of the study was conducted 20th September to 30th October 2010. It was a door-to-door survey by eight teams of research assistants. Each team consisted of a medical student with at least 2 years clinical experience, a community health worker and a literate resident of Ukpo who was the liaison officer. A 2-day workshop was held for all the research assistants prior to the study. The medical students who were the main anchor of each research team also participated in the local validation of the research protocol at the Neurology clinic of NAUTH. A modification of the World Health Organization Neuroscience Research Protocol for detecting the presence of neurological diseases in the community was used in the initial survey.^[9] This was translated to the local dialect and back translated to English to ensure better understanding by the respondents. To avoid losing vital data, one of the investigators versed in Igbo language edited the initial translation before the back translation. The modified protocol was evaluated before the actual study, and a local validation of the instrument at the Neurology clinic of NAUTH yielded a sensitivity of 100% and specificity of 65%. The modifications in the questions were intended at detecting more subtle forms of epilepsy other than the convulsive epilepsies which the previous protocol emphasized. All selected households participated in the study giving a 100% participation.

In the second phase all those identified as possibly having epilepsy were evaluated at the NAUTH Health Center, Ukpo by a neurologist and a senior resident in neurology. The diagnosis of the clinical forms of epilepsy was based on the International League against Epilepsy guidelines 1993 after detailed history and clinical examination.^[15] Electroencephalographic recordings were done for nineteen of the patients.

Ethical approval for the study was obtained from the Ethical Committee of the NAUTH, Nnewi. Informed consent was obtained from the traditional ruler of Ukpo and his cabinet,

heads of households, every adult and parents and guardians of children. All the subjects gave their consent. Parents or close family members acted as proxy for children and persons unable to understand and respond to the questions during all the phases of the survey.

Definitions and inclusion/exclusion criteria

Active epilepsy was defined as the occurrence of two or more unprovoked seizures on different days in the prior year.^[16,17] This definition used in this study has more recently been purported to inform treatment better than the definition of two or more unprovoked seizures in the prior 5 years.^[2,18]

Persons with acute symptomatic (provoked) seizures, single unprovoked seizure or isolated seizure, febrile seizure, neonatal seizure, and nonepileptic events (disturbances in brain functions, e.g. vertigo or dizziness, syncope) and pseudoseizures were excluded. Likewise, a cluster of seizures occurring in a 24-h period was excluded if there was no history of a further repeat episode of seizure. Neonates were also excluded from the study and any member of the selected families who have not been living in the village and have only visited at the time of the survey.

Statistical analysis

Data collected were analyzed using Statistical Package for the Social Sciences SPSS version 15 (SPSS Chicago Inc., Illinois, USA).^[19] Prevalence values with their 95% confidence interval (95% CI) were calculated. Relevant percentages, frequencies, means and standard deviation were calculated, and findings were represented with relevant tables.

The obtained prevalence was age-adjusted to the 2000 projected U.S. population using the direct method. Age adjustment, using the direct method, is the application of observed age-specific rates to a standard age distribution to eliminate differences in crude rates in populations of interest that result from differences in the populations' age distributions.^[20] Age-adjusted rate is a weighted average of the age-specific rates. The age specific rates expressed as proportions multiplied by the age-adjusted weights (2000 Standard Population) yields the age specific adjustment factors for each age group. The sum of the age specific adjustment factors for the age groups covered expressed as a percent is the total age-adjusted rate. The projected U.S. Standard was used to enable direct comparisons with prevalence rates from previous studies as age-adjusted rates being compared must all be based on the same standard population.^[20]

Results

The age and sex distribution of the 6,800 persons screened at first phase of the study are shown in Table 1. There were 3,249 (47.8%) males and 3,551 (52.2%) females.

Table 1: Age and sex distribution

Age group in years	n (%)		
	Male	Female	Total
0-9	886 (27.3)	778 (21.9)	1664 (24.5)
10-19	745 (22.9)	739 (20.8)	1484 (21.8)
20-29	435 (13.4)	537 (15.1)	972 (14.3)
30-39	331 (10.2)	415 (11.7)	746 (11.0)
40-49	229 (7.0)	322 (9.1)	551 (8.1)
50-59	192 (5.9)	246 (6.9)	438 (6.4)
60-69	171 (5.3)	238 (6.7)	409 (6.0)
70-79	142 (4.4)	144 (4.1)	286 (4.2)
≥80	68 (2.1)	95 (2.7)	163 (2.4)
Unknown	50 (1.5)	37 (1.0)	87 (1.3)
Total	3249 (100)	3551 (100)	6800 (100)

Table 2: Age and sex-specific prevalence of epilepsy

Age group in years	Male	95% CI	Female	95% CI	Total	95% CI
0-9	4.5 (4) ^a	0.1-8.9	3.9 (3)	0.0-8.3	4.2 (7)	1.1-7.3
10-19	4.0 (3)	0.0-8.5	8.1 (6)	1.6-14.6	6.1 (9)	2.1-10.1
20-29	6.9 (3)	0.0-14.7	1.9 (1)	0.0-5.6	4.1 (4)	0.1-8.1
30-39	9.1 (3)	0.0-19.3	2.4 (1)	0.0-7.1	5.4 (4)	0.1-10.7
40-49	4.4 (1)	0.0-13.0	6.2 (2)	0.0-14.8	5.4 (3)	0.0-11.5
≥50	3.5 (2)	0.0-8.3	0 (0)	0.0-0.0	1.5 (2)	0.0-3.6
Total	4.9 (16)	2.5-7.3	3.7 (13)	1.7-5.7	4.3 (29)	2.7-5.9
Age-adjusted (2000 U.S. population)	3.9		3.5		4.1	

^aActual number of patients is in parenthesis. CI=Confidence interval

Table 3: Classification of seizures

Type of seizure	Clinical classification (based of clinical assessment only) (%)	Electroclinical classification (based on clinical assessment and interictal EEG recording) (%)
Generalized	(n=18)	(n=5)
Tonic-clonic	17 (58.6)	4 (21.0)
Absence	1 (3.5)	1 (5.3)
Partial	(n=11)	(n=6)
Simple partial	1 (3.4)	1 (5.3)
Complex partial	6 (20.7)	3 (15.8)
Secondarily generalized	4 (13.8)	2 (10.5)
Unclassified	-	8 (42.1) ^a
Total	29 (100)	19 (100) ^b

^aNormal interictal EEG recording; ^bEEG not done for 10 persons. EEG=Electroencephalogram

Seventy-six persons were identified as possibly having epilepsy at the initial screening. Twenty-nine were confirmed to have active epilepsy at the second phase. The remaining 47 cases were peripheral neuropathy (21), febrile convulsion (6), isolated/symptomatic seizures (4), syncopal attacks (4), musculoskeletal disorder (4), dystonia (2) essential tremors (2), benign fasciculations (2) and Parkinsonism (2).

Table 4: Profile of active epilepsy

Characteristics	Number	Percentage of total (%)
Age at onset		
0-9	11	38.0
10-19	9	31.0
20-29	4	13.8
40-49	3	10.4
50-59	1	3.4
70-79	1	3.4
Total	29	100
Mean age at onset	18.5 ± 18.1	
Duration of seizures		
<1 year	2	6.9
1-5 years	15	51.8
6-10 years	8	27.6
11-15	2	6.9
16-20	1	3.4
≥21 years	1	3.4
Total	29	100
Mean duration of seizures	6.07 ± 4.6	
Frequency of seizures ^a		
At least one per day	1	3.4
At least one per week	12	41.4
At least one per month	11	38.0
At least one per year	5	17.2
Total	29	100

^aSeizure frequency the year prior to survey

The point prevalence of active epilepsy was 4.9/1,000 (95% CI: 2.5–7.3) for males, 3.7/1,000 (95% CI: 1.7–5.7) for females and 4.3/1,000 (95% CI: 2.7–5.9) for the total population [Table 2]. The age-adjusted prevalence for the total population was 4.1/1,000 (US Population 2000). The peak age specific prevalence of 6.1/1,000 was in the second decade of life with a second peak in the 4th and 5th decade of life. Those with active epilepsy were 16 (55.2%) males and 13 (44.8%) females with a mean age of 24.48 ± 17.95 years and age range of 4–78 years. The age groups 0–9 and 10–19 accounted for 24.1% ($n = 7$) and 31% ($n = 9$) of the subjects respectively [Table 2].

The identifiable seizure types on clinical assessment only were generalized seizures 62.1% ($n = 18$) and partial seizures 37.9% ($n = 11$) [Table 3]. Electroencephalogram (EEG) was done for 65.5% ($n = 19$) of the subjects. On using electro-clinical criteria for those who had EEG generalized seizures accounted for 26.3% ($n = 5$), partial seizures 31.6% ($n = 6$). The inter-ictal EEG recordings were normal in 42.1% ($n = 8$) but repeat EEG could not be obtained; these could not be classified on the electro-clinical criteria.

The age of onset shown in Table 4 was highest in the first and second decade of life, 38% ($n = 11$) for age group 0–9 years and 31% ($n = 9$) for age group 10–19 years. The mean duration of seizures was 6.07 ± 4.6 years. The seizure

frequency was at least one per week for 41.4% ($n = 12$), at least one per month for 38.0% ($n = 11$), and at least one per year for 17.2% ($n = 5$) for subjects with active epilepsy. One had seizures daily accounting for 3.4% of active epilepsy group.

Possible risk factors for epilepsy were found in 41.4% ($n = 12$) of the subjects. History of febrile convulsions was present in 20.7% ($n = 6$), 10.3% ($n = 3$) had family history of epilepsy either in a first (6.9%) or second (3.4%) degree relative. The history of birth injury and cerebrovascular accident was present in 6.9% ($n = 2$) and 3.4% ($n = 1$) of subjects respectively.

Discussion

We report the prevalence and profile of active epilepsy from a large scale community-based study conducted in a suburban South-eastern Nigerian community. Previous reports on the prevalence of epilepsy in this part of the country are those of a hospital-based study among children and another recent study conducted in a rural community.^[12,21] The need of community-based studies from the same region of the country cannot be overemphasized knowing that the prevalence of epilepsy can vary even in the same region.^[22] The random sampling method used to select the sampled population from the entire population appears adequate and serves to reduce selection bias to a minimum. The age and sex distribution of the study population was typical of the patterns for populations in many developing countries. The mean age of the population was 28.1 ± 22.4 with about 60% of the population below the age of 30 years.

The point prevalence (per 1,000) for active epilepsy obtained in our study was 4.3/1,000 (95% CI: 2.7–5.9). The prevalence of epilepsy from community-based studies in Sub-Saharan Africa involving populations over a thousand persons have varied from as low as 4.0/1,000^[23] to as high as 58/1000.^[7] Lower prevalence are more frequently encountered in community-based studies in Asia.^[8] The prevalence of 4.3/1,000 (95% CI: 2.7–5.9) found in our study is comparable to 4.3 per 1,000 (95% CI: 3.8–4.8) obtained by Coleman *et al.*^[6] in Gambia but greater than 3.9/1000 reported by Mani *et al.*^[24] in India. However, a strict comparison of the results is limited by difference in the study population and diagnostic criteria used. While we studied a suburban community both Coleman *et al.*^[6] and Mani *et al.*^[24] studied rural communities and defined active epilepsy as a case of epilepsy in which there has been at least one unprovoked seizure in the previous 5 years with or without treatment.

The prevalence of 4.3/1,000 obtained in our study was however lower than those of the other previously reported community-based studies in Nigeria. At Igbo-Ora, a

semi-urban community in the Southwest Nigeria with settings comparable with our study community, Osuntokun *et al.*^[10] reported a prevalence of 5.1 for males, 5.6 for females and 5.3 for the total population. Higher prevalence of 6.2/1,000 and 37/1,000 compared to 4.3/1,000 in this present study were found in Udo and Aiyete by Longe and Osuntokun^[11] and Osuntokun *et al.*^[9] respectively. Udo is a rural Edo-speaking community in South-south Nigeria, and the study population was 2,925 while Aiyete is a rural Yoruba speaking community in Southwest Nigeria and the study population was 903. Reviews, however have shown that studies in rural communities and studies with small sample size tend to report higher prevalence of epilepsy, and this may have contributed to the higher prevalence reported in these previous studies.^[2,3] However, it is worth noting that though we used a modification of the protocol used in these previous studies, we defined active epilepsy as two or more seizures in the prior 12 months as against the prior 5 years used in the previous studies. This may have in part contributed to the lower prevalence of active epilepsy found in our study.

The contribution of methodological issues to the difference in the prevalence of epilepsy obtained in our study when compared to these previous Nigerian studies notwithstanding, other factors would have also contributed to the observed difference. Osuntokun *et al.*^[10] had attributed the lower prevalence of epilepsy in Igbo-Ora compared to Aiyete, which was only 20KM away to the existence of health facilities in Igbo-Ora. In Ukpo, our study area there are established health care facilities spanning for over more than four decades. The point in time of our study and the regional difference in epilepsy may also contribute to this observed difference in prevalence. True prevalence of epilepsy is known to vary even from one region of the country to another.^[21] Longe and Osuntokun^[11] had also made reference to such regional difference in the prevalence of epilepsy in the past. These previous Nigerian studies were conducted in Southwest^[9,10] and South-south^[11] Nigeria inhabited by people of different ethnicity and with different beliefs and cultural practices from the people in Southeast Nigeria we studied. Furthermore, these studies were conducted more than three decades ago and with improved health care services in Nigeria especially with the establishment of primary health care programs the effect of risk factors for epilepsy in the communities like childhood infections and poor obstetrics care may actually have reduced compared to three decades ago. Though these various factors may contribute to the observed difference, the extent of their respective contributions and their interplay in the current prevalence of epilepsy in our study remains to be determined and will take further studies to determine.

A more recent Nigerian study by Osakwe *et al.*^[12] reported a prevalence of 4.7/1,000 in a semi-rural Northcentral

Nigerian community, which did not differ much from 4.3/1,000 obtained in our study. Osakwe *et al.*^[13] defined active epilepsy as the presence of a history of multiple unprovoked seizures within a period of 5 years.^[13] This and other methodological differences limited direct comparisons of their findings with ours and may in part contribute to the lower prevalence of active epilepsy found in our study.

The age-adjusted prevalence for epilepsy using the US Population 2000 was 4.1/1,000. This is within the range of 2.5–41.0/1,000 reported when prevalence obtained from studies that used door-to-door survey method were adjusted to US Population 2000.^[3] The age-adjusted prevalence using the US population 2000 for the study in southwest Nigeria by Osuntokun *et al.*^[10] was 4.9/1,000, which did not differ much from 4.1/1,000 obtained in our study. The review by Banerjee *et al.*^[3] that adjusted most reported prevalence in various regions of the world to the US population 2000 showed that except for the highest age-adjusted prevalence of 41.0/1,000 in Nigeria^[9] the other age-adjusted prevalence obtained in Africa ranged from 3.9/1,000 in Tunisia^[23] to 13.2/1,000 in Zambia.^[25]

The prevalence peak (6.1/1,000) of epilepsy in this study was in the second decade of life. This is comparable to 6.2/1,000 in the second decade of life found by Osuntokun *et al.*^[10] but lower than 16.4/1,000 found in a door-to-door survey in rural Southern Tanzania.^[26] High frequencies of epilepsy in the younger age groups, declining steadily with age, have been noted in the tropics.^[10] These have been attributed to inadequate antenatal and prenatal care, widespread malnutrition, genetic factors, untreated or insufficiently treated infections and cerebral infections like malaria and neurocysticercosis.^[27] The higher prevalence of epilepsy in the younger age group may also be a result of both the population distribution of the area (46.3% ≤ 19 years) and early onset of seizures for the majority of the patients. In 68% ($n = 20$) of cases, the onset of epileptic seizures was in the first and second decade of life. The mean age at onset was 18.5 years.

The prevalence of epilepsy was found to be stable in the 3rd and 5th decade but dropped thereafter. This is typical of the pattern reported for most studies in developing countries where the prevalence of epilepsy remains stable in the third and fourth decade and drops after the fifth decade of life.^[3] An increase in prevalence attributed to cerebrovascular diseases and intracranial tumors have been noted after age 60 in a few developing countries and in the developed countries.^[3] Two patients older than 60 years of age were found to have epilepsy in our study.

The frequency of seizures among the people living with epilepsy in our study was high. Seizures frequency was daily or weekly in 44.8% ($n = 13$) of cases. We found a higher prevalence of generalized seizures than partial seizures

as in most community-based studies using only clinical criteria to classify epilepsy.^[3] However, the prevalence of partial seizures was more when electro-clinical criteria were used to classify seizure types. A similar finding of a higher prevalence of partial seizures using electro-clinical criteria was reported by Igwe *et al.*^[28] in a recent retrospective study of cases of epilepsy presenting in a tertiary health facility in Abakaliki, Southeast Nigeria. Prevalence studies relying on the information acquired from door-to-door surveys without availability of diagnostic tests have reported higher proportions of generalized seizures.^[3]

The most prevalent possible risk factor found in our study was a previous history of febrile convulsions. The history of birth trauma was found only in 6.9% ($n = 2$) of persons with active epilepsy in the community, this is probably consequent to the established antenatal care facilities that have existed in this community several years prior to the study. There was only one case of active epilepsy following prior cerebrovascular accident in our study population. The frequencies of these prevalent risk factors notwithstanding, further case control studies are needed to establish any association.

Eleven patients accounting for 37.9% ($n = 11/29$) of the persons living with epilepsy found in our survey had never been treated with antiepileptic drug and thus were antiepileptic drug naïve, while another eleven cases (37.9%) who had previously received antiepileptic drugs had stopped at the time of the survey. Those receiving antiepileptic drugs at the time of the survey were seven (24.1%), of these carbamazepine monotherapy accounted for 57.1% ($n = 4$) while phenobarbitone monotherapy accounted for 42.9% ($n = 3$). All the persons living with epilepsy identified in the survey were commenced on free treatment with antiepileptic drugs under the community neurology program of the institution's Neuroepidemiology Unit.

The limitations of this study include the already discussed issue of inability to make a direct comparison of the result from this study with those of previous studies that defined active epilepsy differently. Also, the possibility of misclassification bias arising from this definition may also not be completely ruled out. However, the benefits of the definition in informing treatment have already been mentioned. Another limitation is that in spite of the enthusiasm shown by the community to the study, a few cases of epilepsy may have remained unrevealed because epilepsy is a stigmatized illness.

These limitations notwithstanding, the prevalence of active epilepsy in Nigerian suburban communities as seen in this present study may actually be on the decrease. The effect of regional differences and difference in time of study on the prevalence of epilepsy in the country may also not be ruled out. It will take conducting similar

studies in other regions of the country and even repeating such studies in the areas where these studies were conducted three decades ago to unveil such differences if they exist. Also, the need to broaden epidemiologic studies on epilepsy in the country to include the determination of the incidence of epilepsy in Nigeria is highly recommended.

Conclusion

The prevalence of active epilepsy in suburban Southeast Nigeria is comparable to that found in developed and some developing countries but less than that reported in suburban Southwest Nigeria about three decades ago.

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