

ORIGINAL ARTICLE

Epilepsy in inmate patients seen in a high complexity reference hospital in Colombia: A cross-sectional study

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Abstract

Objective: To describe the sociodemographic and clinical characteristics of imprisoned patients with epilepsy seen at Samaritana University Hospital (HUS) in Bogotá D.C., between January 2017 and November 2020.

Methods: Cross-sectional cohort study of inmate patients over 18 years of age seen at HUS between January 2017 and November 2020, with a discharge diagnosis of epilepsy. A descriptive univariate analysis of patient sociodemographic and clinical characteristics was carried out.

Results: Overall, 92 patients were included, 95.7% were males with a median age of 32 years (IQR: 26–44); 65% were assessed in the outpatient clinic; median hospital length of stay was 2 days (IQR: 0) and 7.6% required admission to the intensive care unit; 75% had focal onset epilepsy, 63.04% with undetermined etiology 31.52% with structural causes. Polytherapy was found in 53.3%, valproic acid being the most frequently used antiseizure medication in 59.78%; lack of adherence was reported in 15.22% and inadequate seizure control in 81.52%; status epilepticus occurred in 5.34%. A total of 31 EEG recordings and 53 brain images were performed, of which, 29% and 39.62%, respectively, were abnormal. Non-epileptic paroxysmal events were diagnosed in 5.34%, while organic or psychiatric comorbidities were found in 25%, and the use of psychoactive substances was documented in 17.39%. Upon discharge, 93.47% had no disability, and only 45.65% returned for outpatient follow-up.

Significance: The clinical profile was of men in the fourth decade of life with focal onset epilepsy characterized by high seizure frequency, most of whom were receiving antiseizure medication, with a high proportion of polytherapy. The results are a point of departure for prospective studies designed to identify points to intervene and improve healthcare for inmates with epilepsy.

Plain Language Summary: Inmates are a vulnerable proportion of persons with epilepsy. In this group there are significant differences compared to the

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general population, especially with greater psychiatric comorbidity and worse control of epileptic seizures due to difficulties in accessing medical care, antiseizure medication and diagnostic tests. We found that the most characteristic population is made up of men in the fourth decade of life with a high frequency of seizures, most of whom were receiving multiple antiseizure medication. This study is the first of its kind in Latin America and it is an initial approach to epilepsy in inmates.

KEYWORDS

antiseizure medication, epilepsy, imprisonment, vulnerability

1 | INTRODUCTION

Epilepsy is associated with social stigma and higher morbidity and mortality when compared with the general population.¹ There are a few studies in the world, particularly in Latin America, regarding the impact of this condition on vulnerable populations such as inmates.

The importance of this setting was highlighted in a Spanish study which found that epilepsy was the most frequent neurological diagnosis, found in 2 out of 10 imprisoned individuals seen in the outpatient clinic.²

Initial studies on this subject were carried out in the 19th and 20th centuries, trying to identify a relationship between epilepsy and behavioral changes, in particular hetero-aggressive behavior and criminal actions such as murder.³ Alternatively, studies of a potential relationship between electroencephalographic (EEG) abnormality and such behaviors⁴ did not show evidence of differences as compared to healthy individuals, regardless of adherence to antiseizure medication (ASM).^{5,8,9}

New approaches were tried later, such as estimating the prevalence of epilepsy among inmates. A study conducted in England and Wales based on surveys given to treating physicians reported a amount of 8.8 cases for every 1000 inhabitants,⁶ and also highlighted the shortfalls in care afforded to this population, performance of laboratory tests and the use of ASMs.⁷ Another study conducted in the United States reported a prevalence of 2.4% in a single prison, with head injury being the most frequent etiology.¹⁰ Finally, a French study found a relationship between head injury and a three-fold increase in the odds of having epilepsy and reported a 5.9% prevalence of the disease.¹¹

There has also been some interest in exploring comorbidities in this particular population, especially psychiatric conditions. A study carried out in Turkey showed the presence of these conditions in 40.5% of the individuals, the most common being depression, anxiety, personality disorders and substance abuse.¹² In particular, wine-related

Key points

- A vulnerable, stigmatized population with particular needs is described.
- The clinical profile was of men with focal onset epilepsy, coming from an urban setting, with high frequency of seizures, treated with polytherapy.
- A lack of diagnostic test results, low proportion of outpatient follow-up and reports of failure in drug provision were identified.
- Results are a point of departure for prospective studies.

abuse was described in a Polish population and was found to be associated with a four-fold increase in the probability of suffering from epilepsy.¹³

Epilepsy among inmates has been associated with a lower proportion of seizure control, possibly due to inaccurate diagnosis resulting in a lower proportion of assessments by specialists, and use of subtherapeutic doses of antiseizure medication.¹⁴

Given this paucity of information and based on the assumption that there are gaps in healthcare, the objective of this study was to describe the sociodemographic and clinical characteristics of inmate patients seen in a regional referral center in Colombia.

2 | METHODS

Cross-sectional, descriptive, observational study using a hospital database of inmate patients seen at the neurology service of HUS, a regional referral hospital for prisons in the central part of the country in Bogotá, Colombia, during

the time period between January 2017 and November 2020.

All the clinical records were selected using as inclusion criteria patients over 18 years of age with a discharge diagnosis of epilepsy made by a neurologist. The only exclusion criterion was the presence of non-epileptic paroxysmal events (NEPE).

The search was conducted based on the epilepsy and status epilepticus ICD 10 codes. A database was then built with the sociodemographic and clinical and paraclinical variables in relation to the type of epilepsy. To limit the probability of omissions or information errors, each of the principal investigators (DRP and AFMM) worked separately to collect the information. A code associated with the respective information was assigned to each clinical record in order to ensure the anonymity of the reviewed records.

Given that, because of its nature, this study did not require direct patient participation, it was classified as minimum risk, not requiring informed consent. The research protocol was endorsed by the ethics committee of La Samaritana University Hospital (Minutes 12–2020 of the meeting held on 23/12/2020).

The entire inmate population seen at the hospital during the study period was analyzed. Inclusion and exclusion criteria were defined in order to prevent inclusion of inadequate information and avoid potential selection bias before patient data collection. Given the retrospective nature of the study and given the fact that clinical records were the source of information, information bias could occur as a result of clinical record quality; however, to limit the risk of this bias, two residents were entrusted with the collection of patient-related information. On the other hand, there is a confounding risk due to the nature of the study.

The R version 4.0.4 software package was used for the statistical analysis. A descriptive univariate analysis of the sociodemographic, clinical and outcome characteristics of the patients was performed. For quantitative variables, normality was assessed using graphic methods with bar graphs, box and whisker plots, and using the Lilliefors corrected Kolmogorov–Smirnov test for statistical assessment. Given that quantitative variables did not have a normal distribution, median and inter-quartile ranges were calculated for each. Absolute and relative frequencies were described for qualitative variables and were presented using graphic methods.

3 | RESULTS

Data of 92 patients who met the inclusion criteria were analyzed; demographic data is shown in Table 1; mean age

TABLE 1 Sociodemographic characteristics.

Variable	n (%)	Mean (SD)	Range
Gender	92		
Male	88 (95.7)		
Female	4 (4.3)		
Age		35.6 (12.83)	19–68
Marital status			
Married	5 (5.43)		
Single	14 (15.2)		
Free union	7 (7.6)		
Separated	5 (5.43)		
Widow(er)	4 (4.34)		
No information	57 (62)		
Schooling			
Primary	11 (11.96)		
Secondary	44 (47.83)		
Technical	2 (2.17)		
Undergraduate	1 (1.09)		
Graduate	0 (0)		
None	2 (2.17)		
No information	32 (34.78)		
Prison location			
Bogota	68 (73.91)		
Cundinamarca	15 (16.3)		
Caquetá	3 (3.26)		
Tolima	1 (1.08)		
Quindio	1 (1.08)		
Meta	1 (1.08)		
No information	3 (3.26)		

was 32 (IQR: 26–44) years. Variable bias was verified and non-normal distribution was assessed using graphic methods and the Lilliefors corrected Kolmogorov–Smirnov test.

The majority of patients were males (95.7%) and information regarding marital status was obtained only for 38% of the 35 patients, the single category predominating with 14 cases (15.2%). Secondary education was attained by 47.82% and their place of origin before imprisonment was urban in almost all the study population (97.83%). Regarding the place of imprisonment, there was clear predominance of Bogota in 73.91% of cases.

Of all the patients, 65% were assessed at the outpatient clinic while the rest were seen at the emergency department and required admission (7 of them in the ICU); the median length of stay was 2 days (IQR: 0), from a minimum of 1 day to a maximum of 33.

Overall, 75% of patients were diagnosed with focal onset epilepsy, 10.87% with generalized epilepsy, and 14.13% with unclassified epilepsy. The etiology of epilepsy

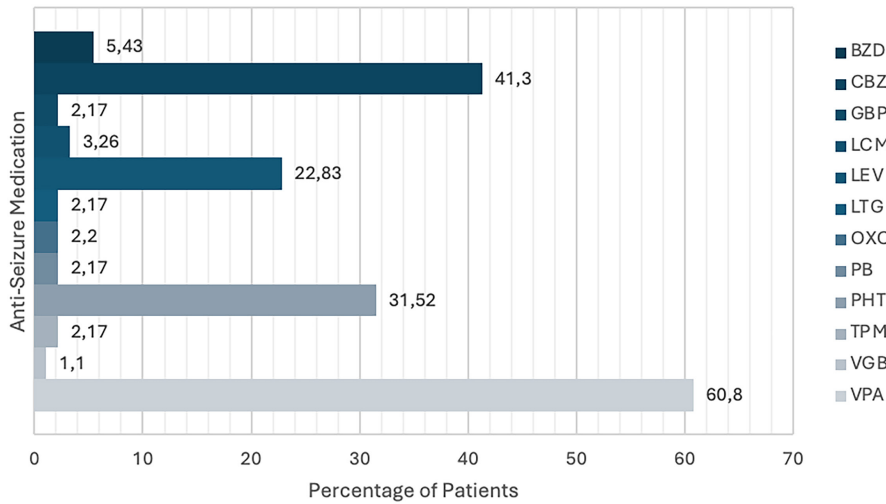


FIGURE 1 Patient distribution by treatment. BZD, benzodiazepine; CBZ, carbamazepine; GBP, gabapentin; LCM, lacosamide; LEV, levetiracetam; LTG, lamotrigine; OXC, oxcarbazepine; PB, phenobarbital; PHT, phenytoin; TPM, topiramate; VGB, vigabatrin; VPA, valproic acid.

was not identifiable in the majority of cases (63.04%); in those patients in which it was identified, 31.52% had a structural etiology and 5.43% a genetic etiology.

Of the 87 who were on treatment with antiseizure medication, 53.33% were managed with polytherapy, valproic acid being most frequently used, followed by carbamazepine and phenytoin (Figure 1); 15.22% of cases reported lack of adherence to medications, and 8.7% of the patients reported failure to receive the medication.

Regarding clinical manifestations, it was found that 75% of the patients had isolated epileptic seizures, 19.56% multiple seizures in 24h, and 5.44% had cluster seizures. Moreover, it was found that 81.52% of the patients had not had adequate seizure control during the year prior to admission. Seizure frequency during the year before admission is shown in Table 2.

Status epilepticus was diagnosed in 4 (5.34%) patients and the same number of patients were diagnosed with non-epileptic paroxysmal events documented by means of videotelemetry. A result was seen in at least one brain image in 53 cases (57.6%); of these, brain CT was available for 23 individuals, brain magnetic resonance for 26 and the two modalities were available for 5 patients. Results were abnormal in 21 cases (39.62%), and imaging abnormalities are shown in Figure 2.

A total of 31 EEG recordings were made in 30 patients (1 patient had one EEG and one 3-h video-EEG), of which 29.03% were abnormal (focal epileptiform activity in 8 and generalized epileptiform activity in 1). As for the duration of the recordings, 87.08% were conventional EEG recordings (30 min) and 3.22% were video-EEG lasting 2, 3, 4, and 6 h each (Table 3).

At least one organic or psychiatric comorbidity was present in 25% of patients, as illustrated in Table 4; and the use of psychoactive substances was documented in 17.39% individuals. Disability assessment at the time of discharge using the modified Rankin scale (mRS), showed

TABLE 2 Patient distribution by seizure frequency (seizures per year).

Seizure frequency (annual)	Absolute frequency (n)	Percentage
0	6	6.52
1–3	25	27.17
4–7	7	7.61
7–10	4	4.35
≥11	39	42.39
No data	11	11.96
Total	92	100

that 93.47% of patients were functionally independent (mRS 0), 2.17% of patients had moderate disability (mRS 3) and 1.1% had died (mRS 6). Finally, only 45.65% of patients had outpatient follow-up by the neurology service.

4 | DISCUSSION

In our study we present different characteristics of a special subpopulation of individuals diagnosed with epilepsy who are considered vulnerable and about which there is very little published in the literature, with the main bibliography dating back to the past century.^{15,16}

The median age of the patients was 32 years, slightly higher than reported in England and Wales in 1962, where ages ranged between 15 and 24 years,⁶ or in the study by Whitman in the United States, with an age range of 24–29 years.⁹ However, it was lower than reported by Stawińska-Witoszyńska et al. in their recent study in Poland in which patients over 50 years of age predominated.¹³

There was predominance of the male gender (95.7%), which is consistent with papers published in this

FIGURE 2 Abnormal neuroimaging findings.

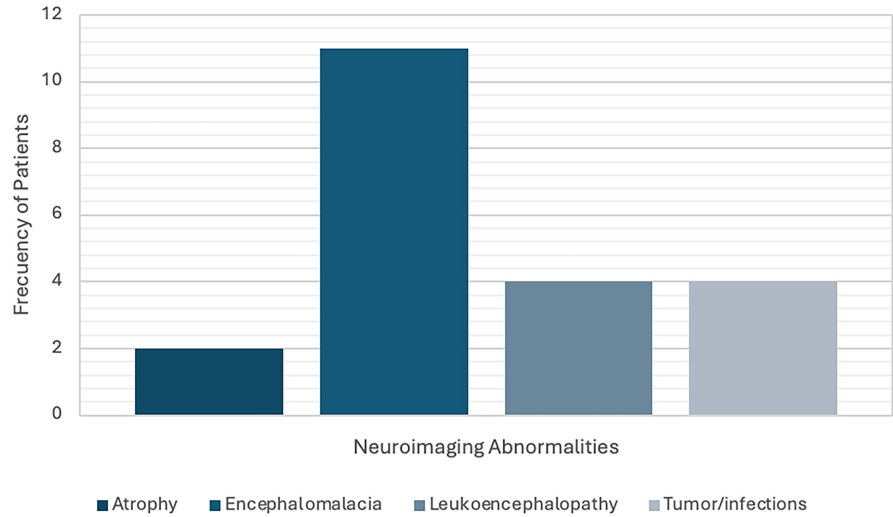


TABLE 3 Electroencephalogram studies and findings.

Patients number	N	Diagnostic test	Finding
30 (1 with 2 EEG)	27	EEG conventional (30 min)	18: Normal EEG (5 NEPE) 9: Abnormal EEG: 1. Right frontal spikes 2. Anterior left spikes 3. Polyspike and slow wave tip in left frontotemporal región 4. Generalized polyspikes-and-slow wave complexes 5. Left anterior temporal sharp waves and slow waves 6. Righth frontal polyspikes 7. Sharp waves in the left anterior region. 8. Sharp and slow waves in the left anterior región 9. Generalized slowing of background rhythms
	1	Video-EEG 2h	Normal
	1	Video-EEG 3h	Normal
	1	Video-EEG 4h	Normal
	1	Video-EEG 6h	Normal

Abbreviations: EEG, electroencephalogram; NEPE, Non epileptic paroxysmal events.

millennium, such as the one from Atinoz et al. in Turkey which reported 90.5%¹² and the one by Medrano et al. in Spain, with a amount of 94.8% out of the total number of patients.² In our study, the gender difference is explained by the fact that most prisons are only for men, and does not necessarily mean that the disease predominates among men in the general population, something which has been attributed to the higher prevalence of risk factors among men.^{17,18}

Focal onset epilepsy was the most frequent form of the disease, as reported also by two studies carried out

in the 1960s and 80s, with 50% and 59%, respectively.^{7,10} However, those publications may have inaccuracies resulting from the changes introduced in the classification of epilepsy and seizures over the years. This is by no means insignificant considering the introduction of 5 classifications in the past 40 years, with repeated definition restructuring.¹⁹⁻²¹

The structural etiology accounted for 31.5% of cases, lower than reported by Whitman et al. en 1981, with 50%,¹⁰ even though it was the most documented etiology in both studies. When compared with the latter series,

TABLE 4 Comorbidities in inmates with epilepsy.

Comorbidity	N	%
Psychiatric	11	11.9
Personality disorder	3	3.26
Depression	3	3.26
Anxiety disorder	2	2.17
Bipolar disorder	1	1.08
Schizophrenia	1	1.08
Post-traumatic stress disorder	1	1.08
Organic	20	21.7
Migraine	3	3.26
HIV	3	3.26
Neurosyphilis	2	2.17
HTN	2	2.17
Intracranial neoplasm	2	2.17
OSAHS	1	1.08
Hypothyroidism	1	1.08
Cerebral toxoplasmosis	1	1.08
COPD	1	1.08
Obesity	1	1.08
Dyslipidemia	1	1.08
Disseminated herpes zoster	1	1.08
CIDP	1	1.08

Abbreviations: CIDP, chronic inflammatory demyelinating polyneuropathy; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus; HTN, hypertension; OSHAS, obstructive apnea and hypopnea syndrome.

there was a higher proportion of epilepsy of unknown cause in our study (50% vs 63%) probably due to the low availability of results for the tests requested by our service, with no evident justification especially in the outpatient clinic, hindering disease classification. In terms of the use of antiseizure medication, there was a significantly higher percentage of polytherapy in our study (53.3%) when compared to the reports by other authors.¹⁴ Valproic acid predominated in almost 60% of cases given its broad spectrum, regular use in neurology services due to ready access, and given its mood stabilizer effect.

On the other hand, failure to provide antiseizure medication was reported in 8.7%, lack of adherence in 15.22%, and only 45.65% of the patients attended outpatient follow-up visits. In view of the above, it was not possible to determine whether the patients on polytherapy were indeed affected by drug-resistant epilepsy, considering that dose adjustments were made several times but it was not possible to measure their impact or identify the need for additional interventions such as assessment by the epilepsy surgery team.

In terms of disease presentation, the majority of patients (75%) had isolated epileptic seizures, while a small percentage of the total (5.34%) was diagnosed with status epilepticus. However, when considering only the hospitalized population, this subgroup would account for 18.69%, a proportion that is lower than reported in a recent study in a German population explicitly aimed at finding patients with a history of status epilepticus over their lifetime and which reported an amount of 34.6% of the total number of patients.²² It is worth highlighting that no questions about a history of status epilepticus was explicitly asked during outpatient assessments, which would explain, at least in part, the low percentage of occurrence of this phenomenon in our group of patients, given that only the hospitalized population would be represented.

A large proportion of patients (81.52%) did not have adequate seizure control during the year before their admission, with more than half of this subgroup having at least a mean of one seizure per month. This value is in contrast with data from the Glasgow cohort published by the group of Kwan et al., which shows that 64% of patients assessed for the first time achieved seizure-free status in the first year of pharmacological treatment.²³ We emphasize that, given the nature of our study, it was not possible to determine the true impact of treatment modifications.

The assessment of comorbidities showed that 11.9% of patients had a mental condition, highlighting that mental disease and the use of psychoactive substances is more common among inmates than among the general population.^{24,25} The psychiatric pathologies found in the study patients correlated with personality disorders, depression and psychotic disorders which were documented as part of a systematic review of prisons in North America, Europe and Oceania,¹⁶ and with the profile identified in a Spanish series in which depression and anxiety were notorious.² Moreover, Altinoz et al. identified depressive (18.5%), anxiety (11%), and personality disorders (11%) as the most frequent psychiatric conditions in inmate patients with epilepsy in Turkey,¹² with higher percentages than evidenced in our study. On the other hand, psychoactive substance use in our patients (17.39%) was similar to the finding in a study conducted in Poland (20.9%) in which alcohol was the predominant substance.¹³

Neurological comorbidities were found in 21.7% of patients and non-neurologic systemic comorbidities varied, consistent with the profile reported in a high complexity German center.²²

The majority of our patients had one brain image (57.6%), a higher percentage when compared with the Polish study already mentioned, which reported that brain imaging was performed in less than 20% of patients, and brain magnetic resonance was performed only in 1 patient.¹³

As for electroencephalography, more recordings were performed in our study (32.6%) when compared with the study by Stawińska-Witoszyńska (11.1%).¹³

In terms of disability at the time of discharge, measured with the modified Rankin scale (mRS), almost all the patients (95.65%) were functionally independent (grades 0, 1 and 2), 3.2% exhibited moderate disability, and 1 patient died during hospitalization, representing 1.08% of all patients. This amount is lower than the 2.9% reported in a cohort study conducted in China, albeit with due consideration to the methodological difference between the two studies.²⁶ Regarding compliance with outpatient follow-up assessments, less than one-half of the patients attended, making it impossible to review diagnostic tests, arrive at a better epilepsy classification, estimate the impact of treatment and its adjustments, or define the need for specific interventions such as assessment by an epilepsy surgery program.

Limitations of this study could be associated with the quality of the clinical records of the study population and with inherent drawbacks such as the retrospective, observational design. However, to control for this limitation, two neurology residents reviewed the clinical records to identify inconsistencies and diminish the risk of information bias.

The following are the potential limitations of our study:

- Because of its nature, calculation of association measures is not possible. Additionally, because of its longitudinal descriptive design, it is not possible to control for confounding factors.
- Generalizations and inferences are not possible because of arbitrary, non-randomized patient selection and the lack of sample size calculation.
- Selection bias: The characteristics of the selected patients may not be similar to those of the patients who were not included in the sample. Given that the subjects of the sample are not representative of the entire population, there may be differences between the included patients and those who were excluded.
- Information bias: Some clinical records did not have all the information that had to be collected.

Furthermore, the female population is under-represented, but this could not be changed or controlled given that, because of administrative and contractual reasons, the majority of patients coming from prisons are males.

5 | CONCLUSIONS

The clinical profile was of men in the fourth decade of life, coming from urban areas, with focal onset epilepsy

characterized by high seizure frequency, most of them treated with polytherapy. Epilepsy of undetermined etiology predominated due mainly to the lack of diagnostic test results (brain imaging and EEG). Attention must be paid to adequate management of neurologic, systemic and psychiatric comorbidities which, taken as a whole, were present in almost one-third of the patients. Unavailability of diagnostic test results, the low proportion of patients returning for outpatient follow-up and failure to provide the antiseizure medication are areas that require intervention if healthcare in this population is to be improved.

Finally, our study, which describes epilepsy in the setting of a vulnerable population, is the first of its kind in Colombia and Latin America. Results can be used as a point of departure for future prospective studies.

AUTHOR CONTRIBUTIONS

David Ríos Patiño, Andrés Morcillo Muñoz: conceived of the presented idea, designed the model and the computational framework, developed the theory, collected the data, analyzed the data, and wrote the manuscript. Pablo Lorenzana Pombo, Patricia Quintero Cusguen: conceived of the presented idea, designed the model and the computational framework, and supervised the project. Hernán Acosta Fajardo, Mateo Enciso Zuluaga: developed the theory and collected the data. All authors provided critical feedback and helped shape the research, analysis, and manuscript. Natalia Losada Trujillo verified the analytical methods.

CONFLICT OF INTEREST STATEMENT

Neither of the authors has any conflict of interest to disclose. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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