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Impact of the COVID-19 pandemic on persons with epilepsy in Uganda: A descriptive cross-sectional study

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ABSTRACT

Objective: To evaluate the impact of the coronavirus disease 2019 (COVID-19) pandemic on the disease course, lives, and psychosocial wellbeing of persons with epilepsy (PWE) in Uganda.
Methods: From April 2021 till May 2021, we carried out a descriptive cross-sectional study at four hospitals located in four regions of Uganda. PWE presenting at the study sites were offered a structured questionnaire in the local language. We used the PHQ-9 questionnaire to screen for depression and the GAD-7 to screen for anxiety. Univariate and multivariable logistic regression was used to investigate factors associated with anxiety and depression.
Results: A total of 370 responses were collected. The median age of the respondents was 20.5 years (IQR 15–29), and 51.9% were males. During the lockdown period, the seizure frequency increased in 87 (23.5%) PWE. Various forms of physical and psychological violence were inflicted upon 106 (28.6%) PWE. Fifty-eight (15.7%) screened positive for anxiety and 65 (17.6%) positive for depression. Both increased seizure frequency and experienced violence were associated with experiencing depression and anxiety.
Conclusion: The COVID-19 pandemic and lockdown impacted seizure frequency and the psychosocial wellbeing of PWE in Uganda. Increased seizure frequency was associated with higher rates of anxiety and depression. This underlines the importance of continued follow-up of PWE and a low threshold to screen for depression, anxiety, and domestic violence.

1. Introduction

Nearly 80% of the 50 million people living with epilepsy live in poor tropical countries like Uganda [1]. The incidence of epilepsy in low-income countries (LIC) is approximately twice that of high-income countries [2]. The high prevalence of epilepsy in sub-Saharan Africa is attributed to acquired and preventable causes like birth trauma, neonatal and infant infections. About 75% of the persons with epilepsy from LIC have inconsistent availability and access to anti-seizure medication, leading to poor seizure control and quality of life [1].

Since 2019, the world has been paralyzed by coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [3]. Like the rest of the globe, Uganda has faced multiple waves of COVID-19, cumulatively registering 126,272 confirmed cases and 3,217 deaths as of October 2021 [4]. These official figures are believed to be an underestimation of the actual burden of COVID-19, as the high cost of testing deterred many people with symptoms from testing. To mitigate the spread, the Ugandan government imposed strict measures and standard operating procedures that included; total lockdowns and night curfews; closure of territorial borders; closure of schools; restrictions on transportation and public gatherings [5,6].

COVID-19 infections and their mitigation methods have had negative socio-economic impacts on the worldwide population, particularly among vulnerable populations such as the elderly, poor, children, the chronically ill, and people with mental illnesses [7,8]. Epidemics and pandemics disrupt preventive and treatment

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services for non-communicable diseases in low-income countries [9]. The impact of COVID-19 on the various aspects of people with epilepsy (PWE) is still evolving. The restrictive measures have severely interrupted health systems necessary for the wellbeing of persons with epilepsy, including; restricted movements to health centers, hospital resources and personnel being diverted to COVID management, loss of income, isolation, and overcrowding dwellings leading to heightened levels of stress. PWE are at an increased risk of having comorbid mental health problems like anxiety and depression [10]. Multinational studies found that the prevalence of psychosocial problems increased among PWE during the COVID-19 pandemic [11,12]. The majority of these studies were carried out mainly in Europe, South America, and North America, which were the pandemic's epicenters. This study sought to understand how the COVID-19 pandemic affected persons with epilepsy and their management in the sub-Saharan country of Uganda.

2. Materials and methods

2.1. Study design and setting

We carried out a descriptive cross-sectional study at four hospitals in four different geographical regions in Uganda: Butabika National Referral Mental Hospital in the central region, Mbale Regional Referral Hospital in the east, Kabale Regional Referral Hospital in the west and Kitgum General Hospital in the north [Fig. 1]. The four hospitals are located in urban areas, but most PWE were from the surrounding districts, primarily peri-urban and rural areas. Each of the four hospitals runs a weekly outpatient clinic dedicated to persons with epilepsy. All the epilepsy clinics are hosted by the mental health departments of each hospital.

2.2. Participants

From April 2021 till May 2021, PWE who attended the epilepsy outpatient clinics of the four participating centers were asked to participate. The study participants had been diagnosed with epilepsy according to the ILAE criteria (at least two unprovoked seizures with a minimal time difference of 24 h between the two events confirmed by a clinician [13], and were registered with the hospital epilepsy clinic for at least one year. To determine the sample size of each study site, we referred to the regional population distribution (Central = 27%, Western = 26%, Eastern = 25%, Northern = 22%) according to the national census [14]. Written informed consent was obtained from all participants before taking part in the study. In the case of minors (<12-year olds), the carers consented on behalf of the child. Ethical approval was obtained from the local Ugandan Institutional Review Board (TASOREC/081/2020-UG-REC-009) and the Uganda National Council for Science and Technology (HS1156ES).

Fig. 1. Map of Uganda showing the location of the four study sites (Butabika, Mbale, Kabale, and Kitgum).

2.3. Data collection

A structured questionnaire was administered to PWE or their caretakers. The caretakers were asked only to give information concerning the PWE. The questionnaire inquired about the patients' socio-demographics, history of epilepsy and its management, general knowledge of COVID infection and its impact on PWE (supplementary file 1). The selection of the psychosocial effects of COVID-19 (violence, depression, anxiety) was based on anecdotal reports that suggested their increase within the communities during the lockdown period [15].

This study refers to depression as a persistent feeling of sadness and loss of interest in previously enjoyed activities. We applied the PHQ-9, a nine-question patient-administered tool to screen for depression symptoms [16]. Anxiety refers to features of intense, excessive, and persistent worry and fear about various domains of life. To screen for anxiety symptoms, we administered the GAD-7, a seven-question patient-administered tool [17]. The GAD-7 has good sensitivity and specificity as a screener for generalized anxiety, panic, social anxiety, and post-traumatic stress disorder [17]. Both the PHQ-9 and GAD-7 have been validated among PWE [18,19].

2.4. Statistical analysis

Data from the questionnaires were entered into an electronic spreadsheet, and quality was checked before the analysis. Categorical variables were described using relative and absolute frequency, while continuous variables were described using median and interquartile range (IQR). We considered PHQ-9 scores of 10 or more as positive for depression [20] and scores of five or more with the GAD-7 as positive for anxiety [21]. Univariate and multivariable logistic regression was used to investigate the determinants of depression and anxiety among the PWE during the lockdown period. Before the logistic regression model, we initially included all determinants with a p-value < 0.1 in the univariate analysis. We further performed a backward stepwise multivariable logistic regression model and eliminated variables with a *p*-value > 0.1 in a multivariable model. The odds ratios (OR) with a 95% confidence interval (CI) were presented; a 5% significance level was used. SAS software version 9.4 (SAS Institute, Inc., Cary, North Carolina, USA) and R software version 4.1.2 (The R Foundation for Statistical Computing, Vienna, Austria) was used to analyze the data.

3. Results

3.1. Socio-demographic characteristics of the study population

A total of 370 responses were collected. Two hundred nineteen (59%) responses were primarily provided by PWE, 101 (27%) by a parent, 34 (9%) by another relative and 9 (4%) by another caregiver. A majority of PWE were males [192 (51.9%)] [Table1]. The median age of PWE was 20.5 years (IQR; 15–29). Only 82 (22.2%) PWE were married or cohabiting with a partner. Three hundred and three

Table 1
Socio-demographic characteristics of the persons with epilepsy.

Characteristics		N = 370
Sex, *n* (%)	Male	192 (51.9)
Median age, years (IQR)		20.5 (15.0–29.0)
Region of residence, *n* (%)	Central	99 (26.8)
	Eastern	93 (25.1)
	Northern	83 (22.4)
	Western	95 (25.7)
Occupation, *n* (%)	Student	121 (32.7)
	Farmer	89 (24.1)
	unemployed	49 (13.2)
	Trade	26 (7.0)
	Others	85 (23.0)
Marital status, *n* (%)	Married	78 (21.1)
	Cohabiting	4 (1.1)
	Single	173 (46.8)
	NA*	113 (30.5)
	Others**	2 (0.5)
Educational status, *n* (%)	None	67 (18.1)
	Primary	189 (51.1)
	Secondary	79 (21.4)
	Tertiary	21 (5.7)
	Vocational	14 (3.7)

NA* Below the age of legal marriage (<18 years old), **, e.g., divorced, widowed

(81%) had received a formal education of primary level and above. The most prevalent occupations were students 121 (32.7 %) and farmers 89 (24.1%).

3.2. COVID-19 symptoms

Since the start of the COVID-19 pandemic, 133 (35.9%) PWE experienced an illness that qualified them as a suspected case of COVID-19 infection according to criteria of the WHO case definition [22] [Table 2]. Forty-five (12.2%) of all PWE and 20 (15.3%) of those meeting the WHO case definition criteria were PCR tested for COVID-19 infection, of whom two (4.4%) tested positive.

3.3. Impact of the COVID-19 lock down on epilepsy and its management

Before the COVID-19 pandemic, 48 participants were experiencing at least one seizure per day (48/370, 13%) [Table 3]. During the lockdown period, 87 (23.5%) PWE experienced an increase in seizure frequency; 93 (25.1%) a decrease and 183 (49.5%) no change in frequency. Optimal compliance to the anti-epilepsy drugs, as prescribed by the clinician, was reported by 324/370 (87.6%) of the respondents. The commonest reasons for non-adherence included: non-availability of the medication in 15 (4.1%); lack of financial means to buy the drugs in 9 (2.4%); and side effects of the drugs in 5 (1.4%). Only 23 (6.2 %) PWE were members of an epilepsy support association.

There were 112 (30.7%) PWE who reported reluctance in making follow-up visits to the health centers, with 97/112 (86.6%) of those citing the fear of being infected with COVID-19 as the main reason [Table 3]. One hundred eighty (48.6%) participants believed that PWE were at a higher risk of being infected by COVID-19 than the general population.

3.4. Psychosocial effects of COVID-19 on persons with epilepsy

3.4.1. Domestic violence

During the lockdown, 106 (28.6%) PWE experienced various forms of physical or psychological violence, while 74 (20%) PWE reported this violence toward other family members. Violence was reported more frequently among females and PWE aged between 10 and 30 years [Fig. 2]. The violence was perpetrated by majorly relatives and family members [parents 20/106 (18.7%), siblings 22/106 (20.8%), relatives 27/106 (25.5%), spouse 10/106 (9.4%)]. Security personnel were responsible for 12.3% (13/106) of the violence reported by PWE.

Table 2
Symptoms of COVID-19 and COVID-19 test results reported by study participants.

Characteristic	N = 370
Clinical symptoms experienced, *n* (%)	
Fever	131 (35.8)
Dry cough	90 (24.6)
Loss of taste	29 (7.9)
Loss of smell	9 (2.5)
Sore throat	29 (7.9)
Productive cough	69 (18.8)
Shortness of breath	20 (5.6)
Stuffy or running nose	104 (28.4)
Headaches	178 (48.6)
Period COVID symptoms last appeared, *n* (%)	
Previous two weeks	54 (14.6)
>14 days but < one month ago	49 (13.2)
More than a month ago	137 (37.0)
No symptoms reported	130 (35.1)
PCR test for COVID-19, *n* (%)	45 (12.2)
Positive PCR test for COVID-19 (n = 45), *n* (%)	2 (4.4)

Table 3
Effect of the COVID-19 lockdown on seizures and epilepsy treatment.

Characteristic	N = 370
Seizure frequency before the COVID-19 pandemic, *n* (%)	
At least one seizure per day (≥30 /month)	48 (13.0%)
At least one seizure in each week of the month (4–29 per month)	81 (21.9%)
At least one seizure in each month of the year (12–20 per year)	150 (40.5%)
Less than 12 seizures per year	70 (18.9%)
No seizure in the last two years	19 (5.1)
No information	2 (0.5%)
Changes in frequency of seizures during COVID-19 lockdown, *n* (%)	
Increased seizure frequency	87 (23.5)
Decreased seizure frequency	93 (25.1)
No change in seizure frequency	183 (49.5)
Other ways the epilepsy treatment was affected during the COVID-19 lockdown, *n* (%)	
Missed the review dates and appointments at the epilepsy clinic	111 (30.0)
The epilepsy medication went out of stock at the health center	45 (12.2)
The epilepsy medication was changed to other types	22 (5.9)
The dose of my epilepsy medicine was increased	13 (3.5)
The dose of my epilepsy medicine was reduced	12 (3.2)
The epilepsy clinic was stopped due to COVID-19	8 (2.2)
Reasons they missing follow up visits during COVID-19 lockdown, (n = 112) *n* (%)	
Feared exposure to COVID-19 infection	97 (86.6)
Believed that health centers were less assessable to the general public	38 (33.9)
Believed hospitals were preoccupied with treating COVID-19	28 (25)
Believed epilepsy symptoms were not that important	6 (5.4)

3.4.2. Anxiety

A total of 58 (15.7%) PWE were screened positive for anxiety. Multivariable logistic regression showed that PWE were more likely to be anxious when: their seizure frequency increased [aOR 3.312, (95% CI: 1.680–6.530) $P = 0.001$]; there was a shortage of food [aOR 2.458, (95% CI: 1.141–5.295) $P = 0.022$]; they experienced violence [aOR 2.093, (95% CI: 1.066–4.111) $P = 0.032$], and were from eastern Uganda (Mbale site) [aOR 7.484, (95% CI:

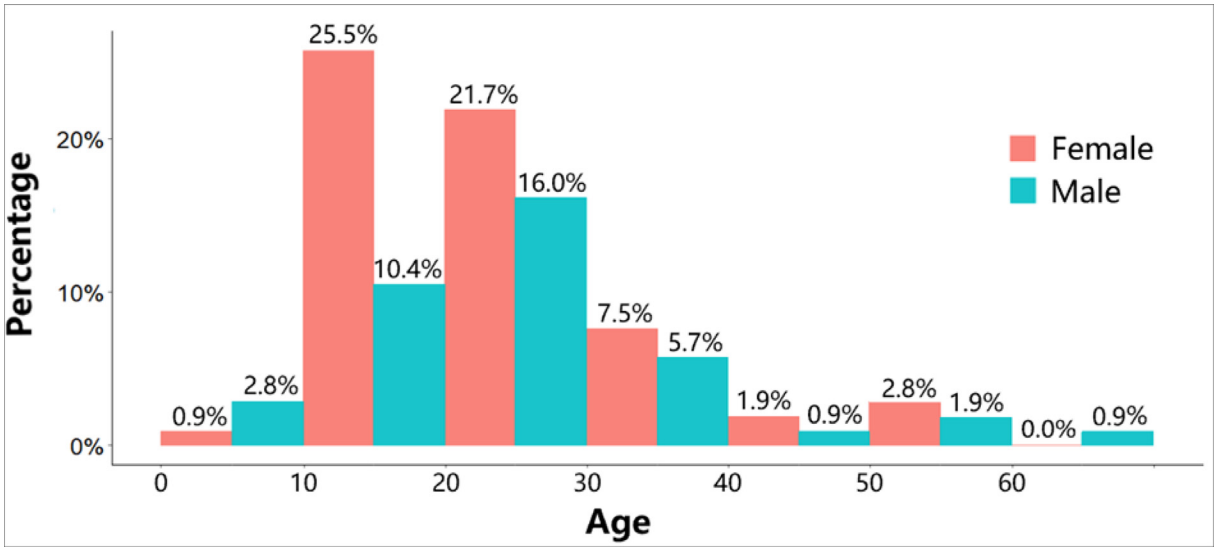

Fig. 2. Histogram showing the distribution of persons with epilepsy in Uganda who experienced violence during the COVID-19 lockdown by age and gender.

2.544–22.017) $P = 0.001$]. The older the PWE, the more likely they screened positive for anxiety [aOR 1.043, (95% CI: 1.016–1.071) $P = 0.002$] [Table 4].

3.4.3. Depression

Of the 370 PWE who completed the PHQ-9 questionnaire, 65 (17.6%) screened positive for depression. Multivariable logistic regression showed that depression symptoms were more likely to be reported among PWE whose frequency of seizures increased during the lockdown [aOR 4.133, (95% CI: 2.135–8.001) P=<0.0001]; those whose economic activities had been interrupted [aOR 3.127, (95% CI: 1.483–6.594) $P = 0.003$]; those who experienced violence [aOR 2.213, (95% CI: 1.132–4.325) $P = 0.019$]; and those who were from eastern Uganda (Mbale site) [aOR 3.318, (95% CI: 1.401–7.860) $P = 0.006$] [Table 5].

3.5. Comparing answers according to the main respondent (persons with epilepsy versus carer)

The mean age of PWE for whom the responses were mainly provided by their carers was lower compared to the mean age of PWE who responded for themselves. This was 19 years (SD = 11) versus 27 years (SD = 13), respectively. Depression symptoms were significantly reported more by the PWE than the carers ($P = 0.001$, Fisher's exact test). Similarly, domestic violence was reported more by PWE [33.0% (72/218)] compared to the caregivers [21.5% (31/144)].

Table 4
Logistic regression model to assess the determinants of anxiety among persons with epilepsy during the COVID-19 lockdown.

Determinants	uOR (95% CI)	aOR (95% CI)	*P*-value
Age (years)	1.036 (1.016–1.056)	1.043 (1.016–1.071)	0.002
Gender (Female vs Male)	1.961 (1.103–3.488)	1.941 (0.969–3.891)	0.061
Study site (Butabika vs Kabale)	0.625 (0.171–2.287)	0.900 (0.211–3.836)	0.887
Study site Kitgum vs Kabale)	3.272 (1.206–8.877)	3.139 (1.031–9.554)	***0.044***
Study site (Mbale vs Kabale)	8.158 (3.221–20.667)	7.484 (2.544–22.017)	***0.001***
Experienced violence (yes vs no)	3.026 (1.702–5.381)	2.093 (1.066–4.111)	***0.032***
Shortage of food (yes vs no)	2.027 (1.080–3.806)	2.458 (1.141–5.295)	***0.022***
Interrupted economic activity (yes vs no)	2.874 (1.564–5.278)	1.171 (0.557–2.461)	0.678
Increased seizures (yes vs no)	4.793 (2.658–8.644)	3.312 (1.680–6.530)	***0.001***

uOR: unadjusted odds ratio; aOR: adjusted odds ratio; CI: confidence interval.

Table 5
Logistic regression model to assess the determinants of depression among persons with epilepsy during the COVID-19 lockdown.

Determinants	uOR (95% CI)	aOR (95% CI)	*P*-value
Age (years)	1.027 (1.008–1.047)	1.018 (0.993–1.043)	0.166
Gender (Female vs Male)	1.377 (0.801–2.366)	1.100 (0.564–2.144)	0.781
Study site (Butabika vs Kabale)	0.659 (0.369–1.179)	0.278 (0.077–1.001)	0.051
Study site Kitgum vs Kabale)	1.170 (0.648–2.114)	0.619 (0.231–1.655)	0.339
Study site (Mbale vs Kabale)	3.603 (1.955–6.640)	3.318 (1.401–7.860)	0.006
Experienced violence (yes vs no)	3.001 (1.727–5.214)	2.213 (1.132–4.325)	0.019
Interrupted economic activity (yes vs no)	3.540 (1.947–6.437)	3.127 (1.483–6.594)	0.003
Shortage of food (yes vs no)	2.222 (1.209–4.086)	1.503 (0.730–3.094)	0.269
Increased seizures (yes vs no)	5.676 (3.205–10.054)	4.133 (2.135–8.001)	<0.0001

uOR: unadjusted odds ratio; aOR: adjusted odds ratio

Carers significantly reported more on treatment access challenges ($p < 0.05$, Fisher's exact test). Answers about anxiety, change in seizure frequency, and experienced violence were not statistically different between the two groups of respondents [supplementary file 2].

4. Discussion

We assessed the impact of the COVID-19 pandemic on epilepsy care in Uganda in the period April till May 2021. At the time of the survey, the peak of the first COVID-19 wave had passed, and the second wave was about to start. Confinement measures with a curfew between 9 PM and 6 AM and some travel restrictions were still in place [6].

From the start of the COVID-19 pandemic, 133 PWE (35.9%) had experienced symptoms of a suspected case of COVID-19 according to the clinical criteria of the WHO case definition [22]. However, only a minority of this group (12.2%) got tested, with only two positive results. This suggests that our study population was undertested. However, only a minority of the PWE meeting the COVID-19 WHO case definition reported having experienced loss of taste or smell, the most specific COVID-19 symptoms. Therefore, most symptomatic study participants did not contract a COVID-19 infection, as only 2/45 (4.4%) tested positive. Moreover, none of the participants reported a severe illness during the lockdown period. Coronaviruses have been shown to be able to invade the central nervous system and cause neurological pathologies including seizures [23]. However, as this only happens in patients with severe COVID-19 disease, a COVID-19 infection was not a cause of the seizures in our study participants.

During the lockdown, an increase in seizure frequency was reported by 23.5% of the respondents. In the literature, increased seizure frequency among PWE of between 6% and 35% has been reported during the COVID-19 pandemic [24]. PWE, who reported increased seizure frequency, also had increased odds of having anxiety and depression. A decrease in seizure frequency was also noted in 25% of patients. Two studies in Italy reported similar findings [25,26]. The authors hypothesized that the decreased frequency was due to a 'quarantine effect' with a relative reduction of triggers for epileptic seizures. Another possible explanation is better seizure control due to reduced social stress and improved therapeutic adherence when living at home surrounded by family.

Among our study participants, 15.7% screened positive for anxiety and 17.6 % for depression. Psychiatric disorders are disproportionally more common in PWE, with mood and anxiety disorders being the most prevalent. A recent meta-analysis of 23 articles among PWE performed between 2008 and 2018 found a prevalence of 24.2% for depressive disorder and 11.1% for anxiety disorder [27]. Our results indicate a slightly lower percentage for depression. However, the studies included in the meta-analysis only included persons older than 18 years and mainly used clinical interviews rather than questionnaires like the PHQ-9 questionnaire. Given the lack of prevalence data on anxiety and mood disorders among African PWE, we cannot assess whether the rates of depression and anxiety among PWE in Uganda changed during the COVID 19-pandemic. An increase in mental health problems in the general population was reported in Uganda during this period [15], so probably also among PWE. Our findings underline the importance of screening PWE for anxiety and depression.

Another finding of our study is the high rate of violence experienced by PWE, especially among females. Since the implementation of the COVID-19 lockdown in Uganda, domestic violence, and in particular child abuse, has been reported from different parts of the country [28]. Persons with epilepsy are a vulnerable population group. Recent research in Uganda showed there are still negative attitudes and erroneous beliefs in the communities leading to the stigmatization of PWE [29]. Ainamani et al. reported an increase in domestic violence, gender-based violence, stigmatization of people with COVID-19, child abuse, and mental health problems, including among PWE since the COVID-19 pandemic in Uganda [15]. Despite the high rates of violence recorded, it is possible that the caregivers, especially if they were the offenders, underreported these occurrences. The victims might also have felt restrained to report the violence, especially in the presence of the caregivers. Interventions to address these problems in a disrupted healthcare system are challenging but urgently needed. A higher prevalence of anxiety and depression was observed from the Mbale study site (eastern region). This could be because the eastern region of Uganda has a worse socio-economic status than the other regions [30]. The COVID-19 pandemic and lockdown worsened the region's deficient basic amenities like food supply, health care, and transport.

Our study has several limitations. Firstly, we only included PWE who presented at higher health centers levels. Due to the COVID-19 restrictions, we did not study PWE who had remained in the community or at lower healthcare levels. This explains the participants' high adherence to anti-seizure medication, as most of them attended the clinics to obtain treatment. Secondly, each of the four study sites had a different research team with varying clinical experience. That difference in personnel might have resulted in varying degrees of eliciting psychosocial symptomatology. Thirdly, our cross-sectional design does not allow us to test for causal relationships. Additionally, the study team did not formally follow-up on the patients who screened positive for depression and anxiety, neither did we report the cases of violence toward the PWE.

Our study provides important information on PWE and their management during the COVID 19-pandemic and the lockdown in Uganda. The lockdown reduced access to health care for PWE worldwide [12], including in Uganda. There should be a low threshold to screen for depression, anxiety and domestic violence, especially during these challenging times. The presence of mental disorders can complicate treatment and treatment response, so early detection is vital.

5. Conclusion

The COVID-19 pandemic poses specific challenges to PWE, even more so in low-income countries. In our population, both an increase and decrease in seizure frequency was reported. Rates of anxiety and depression in our cohort were 15.7% and 17.6%, respectively. Both were associated with increased seizure frequency. A total of 106 (28.6%) PWE experienced violence during the lockdown. This underlines the importance of early screening to identify mental disorders and signs of domestic violence in PWE and to organize a systematic follow-up of patients to address these problems.

Competing interests

The authors declare no competing interests.

Authors contribution

Study conception and design: Nolbert Gumisiriza (GN), Colebunders Robert (CR.), Denis Nono (DN), Seggane Musisi (SM) Collection of data: GN. Analysis and interpretation of data: G.N., Kamoen Olivia (KO), Boven Annelies (BA), Dusabimana Alfred (DA) and CR.

Writing of the paper: GN, KO, BA, DA, and CR. All authors read and approved the final version.

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Appendix A. Supplementary data

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