Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Prevalence of depression and suicidal ideation in persons with epilepsy during the COVID-19 pandemic: A longitudinal study from India

Jatinder Katyal a,⇑, Haroon Rashid a, Manjari Tripathi b, Mamta Sood c

aNeuropharmacology Laboratory, Department of Pharmacology, All India Institute of Medical Sciences, New Delhi 110029, India
bDepartment of Neurology, All India Institute of Medical Sciences, New Delhi 110029, India
cDepartment of Psychiatry, All India Institute of Medical Sciences, New Delhi 110029, India

ARTICLE INFO
Article history:
Received 19 July 2021
Revised 25 August 2021
Accepted 13 September 2021
Available online 20 September 2021

Keywords:
COVID-19
Seizures
Persons with epilepsy (PWE)
Depression
Suicidal ideation
Mini International Neuropsychiatric Interview (MINI)
Anti-seizure medication (ASM)

ABSTRACT
Objectives: COVID-19 pandemic has disrupted healthcare services for chronic disorders such as epilepsy. In this study, the impact of COVID-19 pandemic on persons with epilepsy (PWE) with regard to their seizure control, depression status, and medication adherence was assessed.

Methods: After ethical clearance, 449 PWE who had been previously evaluated for depression at All India Institute of Medical Sciences (AIIMS), New Delhi, India, were telephonically revaluated using Mini International Neuropsychiatric Interview and surveyed for source of medication and medication adherence over past 6 months. The prevalence and the association of depression, suicidality, and seizures during pandemic with different PWE variables were determined.

Results: Out of 449 PWE, 70.6% responded. 19.9% were diagnosed positive for depression as per MINI while suicidal ideation was observed in 5.4%. Seventy six (23.9%) PWE reported seizures during pandemic. The incidence was greater in females, unemployed, previously uncontrolled epilepsy, polytherapy, altered use of medications, and depressed PWE. Seizure during pandemic, increased seizure frequency, previous history of depression, and altered use of medications were all significantly associated with depression during COVID-19 pandemic (2.6–95%CI, 1.45–4.73; 1.9–95%CI, 1.01–3.57; 8.8–95%CI, 4.54–17.21; 2.9–95%CI, 1.19–7.24), and polytherapy (2.9–95%CI, 0.92–9.04), seizures during pandemic (3.9–95%CI, 1.45–10.53) and previous history of depression and suicidality, were related with suicidal ideation.

Conclusion: COVID-19 pandemic-induced disruptions can be detrimental for PWE, and restoring services to the precovid levels as well as putting appropriate continuity plans in place for care of PWE should be a priority.

© 2021 Elsevier Inc. All rights reserved.

1. Introduction

The COVID-19 pandemic has resulted in a massive strain on healthcare facilities leading to major disruptions and collapses all over the world [1,2]. While wave after wave of infection spreads, the extremely high morbidity and mortality have necessitated imposition of stringent measures like curfews and lockdowns, diversion of available healthcare workers for COVID management, and changes in resource allocations. These changes in healthcare dynamics coupled with stress and financial hardships have invariably compromised the level of care for sick individuals particularly for chronic disorders like epilepsy [3]. It is conceivable that PWE are more likely to be affected during COVID19 pandemic because of multiple stressors i.e., disease, mobility restrictions, financial hardships, lack of routine medical access, etc. In a survey conducted on 337 members of American epilepsy society, concerns were raised that PWE did not get adequate medical care. While 10% of respondents noted worsening in seizure frequency, 5% noted an improvement [4]. Epilepsy is one of the most common neurological disorders with an overall prevalence of 5–9 per 1000 population across the globe [5]. Whereas most PWE require anti-seizure medications (ASMs), the mainstay of treatment, for many years or even lifelong, nearly 25–30% do not respond i.e., patients with refractory seizures may require surgical intervention [6]. Epilepsy is also associated with multiple comorbidities and neuropsychiatric problems. Depression in particular has been reported in a sizable proportion of PWE [7–10] and a bidirectional relationship between epilepsy and depression is suggested [11]. While many studies over the past one year have reported an increase in seizure frequency in PWE [3,12–18], to the best of...
our knowledge, studies assessing the impact on depression in PWE are scarce. A few studies have evaluated the mental health of PWE i.e., anxiety, depression, and psychological distress using online surveys [3,12,14–21], but in all these studies the baseline status of PWE was not available and therefore the impact of COVID-19 cannot be assessed.

In this study, in order to determine the effect of COVID19 pandemic on depression in PWE, we reevaluated PWE who had been previously evaluated for depression and suicidal ideation.

2. Material and methods

This longitudinal study was conducted from September to October 2020 which corresponds to unlock 3.0 in India.

2.1. Study participants

We had concluded an ongoing study on depression in PWE in March 2020 at All India Institute of Medical Sciences (AIIMS), New Delhi, a tertiary care center in India. Since a follow-up was planned, informed consent for the same was recorded which enabled us to carry out this study. Thus the demographic data, baseline data on depression and seizure frequency for comparison were available. After taking ethical clearance from the Institute Ethics Committee at AIIMS, New Delhi, the participants of the study i.e., the PWE who had previously attended neurology OPD at AIIMS, New Delhi, India, and had given informed consent, were telephonically informed about the study, evaluated for depression, and also a short survey pertaining to seizure frequency and compliance was carried out. The inclusion criteria followed for recruiting the patients were age ≥18 years, either gender, meet diagnostic criteria for epilepsy as per ILAE, and on ASMs. Those with any other comorbidity were excluded.

2.2. Assessment of depression in PWE

We had previously used Mini International Neuropsychiatric Interview (MINI: version 6.0.0) for evaluation of depression and suicidal ideation in these patients. The same version was reapplied. The permission for using MINI (version 6.0.0) was duly obtained. Both English and Hindi versions were used. The evaluator was naive to the previous status of PWE i.e., depressed or not depressed.

2.3. Survey questionnaire

The 6-item survey questionnaire was optional for the PWE. The respondents were asked closed-ended questions relating to the source of medication and the medication adherence over the past 6 months.

2.4. Statistical analysis

Statistical analysis was performed using STATA statistical software, version 14. The categorical variables between the group with depression and the group without depression were compared using the chi-square test, while continuous variables were compared using the Student t-test. A significance level of $p < 0.05$ (two-tailed) was adopted. Univariate and stepwise multivariate logistic regression were applied to find independent associiative factor of depression, suicidality, and seizures during follow-up, and unadjusted and adjusted odds ratios were calculated. R (version 4.1.0) was used for paired plot analysis between PWE with and without depression, and PWE with and without seizures during pandemic period.

3. Results

Out of 449 PWE approached, 317 responded (response rate 70.6%) (Fig. 1). Of these, majority (52.05%) were assessed 13–24 months ago while 17.66% and 30.28% were assessed in the preceding 12 months and more than 24 months ago, respectively. There was a similar representation of both genders (162 male and 155 females), 35% PWE had a diagnosis of focal seizures, 65% had generalized seizures, 46% were on monotherapy, and rest were on polytherapy. A total of 17 PWE had undergone drug tapering. There was no significant difference when demographic features of these 317 PWE were compared with total study subjects i.e., 449.

3.1. Seizure frequency during COVID-19 pandemic

In all, 76 PWE reported seizures during the pandemic and the number of seizures ranged from 1 per year to >3 per month. Maximum seizures were seen in those followed up after 13–24 months (39.28%) and minimum (15.63%) in those evaluated after 24 months. Expectedly, 92.1% seizures were seen in PWE with uncontrolled seizures vs. 7.9% in PWE with previously controlled seizures. Only 1 seizure was seen from all PWE with previously controlled seizures. Among those PWE showing seizures during pandemic, the frequency of seizures declined in 25%, increased in 44.7%, and remained unchanged in the rest (Table 1).

Table 1. Characteristics of Persons with Epilepsy Enrolled in the Study

| Days since Follow-up | Seizures | p-value |
|---------------------|---------|---------|
| ≤3 months           | 110      | 0.02    |
| 3–6 months          | 100      | 0.05    |
| 6–12 months         | 90       | 0.03    |
| 12–24 months        | 80       | 0.01    |
| >24 months          | 70       | 0.001   |

Fifty percent of PWE who were not taking ASMs or had altered the dose of ASM showed seizures versus 24% in the whole follow-up group. Pair-wise analysis is given in Fig. 2(a).

3.2. Prevalence of depression

Out of 317 PWE, 19.9% met the criteria for depression as per MINI as opposed to 40.1% that were depressed in previous assessment (Table 2). Thus a highly significant reduction was observed. Of these, 13 PWE had new-onset depression, i.e., had not screened positive previously. Among those who had undergone tapering, only 1 had depression and the subject had tested positive earlier also.

The percent depressed at all the three time intervals i.e., ≤1 year, 1–2 years, and >2 years was similar i.e., 16.07%, 20.6%, and 20.8% respectively. Similarly gender also did not have any effect, the prevalence of depression being nearly 20% in both genders. A higher percentage of those on polytherapy tended to be positive for depression as opposed to those on monotherapy (21.5% vs. 17.93%). This was not statistically significant. There

Fig. 1. Flow chart showing characteristics of persons with epilepsy enrolled in the study.
was however no new-onset case of depression in PWE on monotherapy. The pairwise relationship between different variables is given in Fig. 2(b). Nearly 40% of PWE who had had a seizure in the past 6 months were depressed. When a comparison of previously controlled (no seizure in past 2 years) and uncontrolled (seizure episodes during past 2 years) was carried out, it was observed that of 221 PWE with uncontrolled seizures, 22.17% had depression and of this 16.33% was new onset. In case of PWE with controlled seizures, 14.58% had depression and of this 35.71% was new onset.

In case of PWE with seizure episodes during past 2 years) was carried out, it was observed

3.4. ASM compliance

A total of 12 PWE reported not taking the ASM at all while 9 had reduced the use of medication. The reasons cited were mostly financial difficulty or no access, although loss of interest was also cited as a reason. For nearly 96% of PWE, procuring ASMs was an out of pocket expense (Fig. 3). Noncompliance was more with monotherapy, in female PWE, and in those with previously uncontrolled seizures.

3.5. Regression analysis

Table 3 gives the odds ratio for different variables. Univariate analysis revealed that the incidence of seizures during pandemic was greater in females, unemployed, those on polytherapy, depressed PWE, and altered use of ASMs. In case of depression, seizures during pandemic, increased seizure frequency, positive for depression previously, and altered use of ASMs were all significantly associated with depression during Covid-19 pandemic. After multiple regression analysis, seizures during pandemic (2.2 (95% CI 1.14–4.17), $p$ value = 0.019) and precovid depression (7.8 (95% CI 3.99–15.38), $p$ value <0.0001) were significantly associated with depression during pandemic. Univariate analysis also revealed association between seizures during pandemic, precovid depression as well as suicidal ideation and polytherapy with suicidal ideation during pandemic.

4. Discussion

Although many studies are now focused on understanding seizure control in PWE in relation to various COVID19 pandemic-associated factors like suspension of routine outpatient department services, non-availability of EEG facilities, inaccessible medication due to shortages and mobility restrictions, uncertainty over finances and change in societal and family dynamics, very few are focusing on impact on comorbidities like depression. Some workers carried out online surveys across countries, but mostly through social media to determine the effect on depression and anxiety and psychological stress as a measure of depression and anxiety [12,20,22]. These studies have some inherent limitations like small sample size, limited and very specific reach due to use of online media, and importantly lack of baseline data. Here it is worthwhile to mention that prevalence of depression in PWE up to even 88% has been reported though the range is 20–55% in most studies [23,8,24]. Since we had evaluated 449 PWE for depression using four different scales over the past few years before the start of pandemic in India [7], these same patients were re-evaluated telephonically for depression. The response rate was 70%, and MINI was used.

Mini International Neuropsychiatric Interview is a semi-structured diagnostic interview recognized as gold standard for validation of diagnosis of depression [25]. It uses Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and International Classification of Diseases, Tenth Revision (ICD-10) criteria to diagnose depression and has been validated previ-
ously against structured clinical interview for diagnosis (SCID) in PWE [25]. Previously a number of studies have used telephonic mode for MINI to assess depression [26–29] and it has been reported that telephone versus in-person mode do not influence findings [26,30–33].

We observed a highly significant decrease in prevalence of depression in PWE during the follow-up during COVID 19 pandemic. Although we did not come across any comparable, i.e. both pre-COVID and post-COVID studies, in PWE, in studies comparing PWE with healthy subjects, mostly an increased depression and anxiety in PWE has been reported [3,21]. Van Hees et al. also reported a prevalence of 39.8% and 46.9% using HADS and PHQ-9, respectively in PWE [20]. These values fall in the reported range of 20–55% [8]. However, Abokalawa et al. reported prevalence of depression as high as 66.2% [22], whereas it was 12.2% in a Spanish study [14].

The reasons for decrease in depression prevalence are not clear. While it can be contended that the patients identified as depressed previously would have received treatment for it and therefore decreased incidence. However, of the previously depressed PWE, in this follow-up among the respondents, only 03 PWE were on antidepressants, and of these three, 02 were still screened positive for depression. A case-to-case analysis of previously depressed and now not-depressed PWE reveals that 17 were PWE with controlled seizures who were no longer on ASMs. Among these only one was assessed as depressed as opposed to 03 previously. A good percentage screening positive with MINI, 65% were previously assessed as mild cases using PHQ-9 and HAM-D, respectively, and almost 96% were strictly adhering to their ASM schedules. Since the survey was carried out during lockdown, a probable better support structure and care with regard to ASM schedule could have contributed. The role of social capital in enhancing quality of life in PWE and mitigating neuropsychiatric problems has been proposed [34–36]. A large longitudinal study during the COVID-19-related lockdown in the UK has reported that those with higher levels of perceived social support had markedly lower depressive symptoms and depression risk [37]. Many other studies have suggested that having positive and enjoyable social experiences is linked to lower
depressive symptoms [38]. The risk of underestimating however on account of telephonic interview cannot be ruled out, it has been reported that in population with low or intermediate risk of psychiatric disorder, the sensitivity of telephonic interview is low, implying that many of the cases might be missed by the telephone interview in comparison with the face-to-face interview [39–41].

In contrast to the precovid results for factors affecting depression in PWE, no association between female gender and depression was observed. Polytherapy was however significantly associated along with seizure incidence and frequency. A similar trend was seen for suicidal ideation as well.

Polytherapy, seizure frequency, and seizure incidence are well-recognized risk factors for depression in PWE. Polytherapy itself would imply a more severe disorder, and use of multiple ASMs further compounds the risk due to their inherent adverse effect profiles [7,42,43]. Occurrence of seizures on the other hand is a major stressor [11,44].

Another notable finding in this study was an altered seizure control in 70% PWE. The seizure frequency tended to increase in 44.7% PWE who experienced seizures. Seizure worsening during COVID-19 pandemic has been reported by other workers also [3,12,13,16,17], but report of worsening as well as improvement are also available [4]. Fonseca et al. and Tedrus et al. reported an increase in seizure frequency in almost 10% of PWE during the pandemic period [14,15]. As for factors associated with seizure worsening, sleep disorder, polytherapy, and compliance issues were found to be related. We did not delve into sleep disorders, but in our study also polytherapy and altered use of medicine were associated. Apart from these, depression was also identified as a significant contributing factor. It is conceivable that previously proposed bidirectional relationship between seizure and depression is not restricted to neuropathological changes but has some component of ASM as well [8,11,42].

The altered use of medicine was implicated not just in seizure occurrence but also in depression and suicidal ideation. In the latter, it may be an outcome rather than a cause as 02 PWE described loss of interest as a reason for not taking ASMs. Nearly 50% of those not adhering to ASMs were found to be depressed. In other cases financial difficulty and inability to obtain medicine were cited as reasons for noncompliance. Surveys conducted worldwide have reported that PWE experienced difficulties during the pandemic in obtaining medications [19]. Asadi-Pooya et al. also reported that

---

**Table 2**

Comparison of clinicodemographic variables in persons with epilepsy (PWE) with or without depression during COVID-19 pandemic.

| Variable                        | Number of PWE | PWE (with Depression) | PWE (Without Depression) | p value |
|---------------------------------|---------------|------------------------|--------------------------|---------|
|                                 | N             | %                      | N                        | %       |
| Total                           | 317           | 63 100.0               | 254                      | 100.0   | 0.2114 |
| Age 18–30 years                 | 217           | 39 61.9                | 178                      | 70.1    | 0.7364 |
| >30 years                       | 100           | 24 38.1                | 76                       | 29.9    |         |
| Gender                          |               |                        |                          |         |
| Male                            | 162           | 31 49.2                | 131                      | 51.6    |         |
| Female                          | 155           | 32 50.8                | 123                      | 48.4    |         |
| Employment status               |               |                        |                          |         |
| Employed                        | 117           | 21 33.3                | 96                       | 37.8    | 0.5112 |
| Unemployed                      | 200           | 42 66.7                | 158                      | 62.2    |         |
| Time to follow-up               |               |                        |                          |         |
| ≤12 months                      | 56            | 9 14.3                 | 47                       | 18.5    | 0.7336 |
| >13–24 months                   | 165           | 34 54.0                | 131                      | 51.6    |         |
| >25 months                      | 96            | 20 31.7                | 76                       | 29.9    |         |
| Epilepsy type                   |               |                        |                          |         |
| Focal                           | 111           | 23 36.5                | 88                       | 34.6    | 0.7815 |
| Generalized                     | 206           | 40 63.5                | 166                      | 65.4    |         |
| Number of ASMs                  |               |                        |                          |         |
| Monotherapy                     | 145           | 26 41.3                | 119                      | 46.9    | 0.4261 |
| Polytherapy                     | 172           | 37 58.7                | 135                      | 53.1    |         |
| Seizure Control                 |               |                        |                          |         |
| Seizure free >2 yrs             | 119           | 18 28.6                | 101                      | 39.8    | 0.1005 |
| Seizures within 2 yrs           | 198           | 45 71.4                | 153                      | 60.2    |         |
| Seizure during Pandemic period  |               |                        |                          |         |
| YES                             | 76            | 25 39.7                | 51                       | 20.1    | 0.0011 |
| NO                              | 241           | 38 60.3                | 203                      | 79.9    |         |
| Previous Depression status      |               |                        |                          | <0.0001 |
| Depressed                       | 127           | 50 79.4                | 77                       | 30.3    |         |
| Not Depressed                   | 190           | 13 20.6                | 177                      | 69.7    |         |
| Previous Suicidality status     |               |                        |                          | 0.0019  |
| Present                         | 16            | 8 12.7                 | 8                        | 3.1     |         |
| Absent                          | 301           | 55 87.3                | 246                      | 96.9    | <0.0001 |
| Current Suicidality status      |               |                        |                          |         |
| Present                         | 17            | 16 25.4                | 1                        | 0.4     | <0.0001 |
| Absent                          | 300           | 47 74.6                | 253                      | 99.6    |         |
about one-third of PWE faced difficulties in obtaining their medicines [18]. Van Hees et al. have reported the unavailability of ASMs to be majorly on account of non-availability (69.4%), mobility restrictions (12.5%), and financial problems (12.5%) [20]. However, few studies reported that no significant problem was experienced by PWE in accessing drugs [16], and most of the patients were compliant with their ASMs. A 93% compliance rate was reported in an Italian study [3], 93.5% in the Saudi study [12], and 96% in Kuwaiti study [22] which is similar to this study.

Limitations of study: One of the major limitations is that the COVID status for self and any impact on family were not determined by PWE in accessing drugs [16], and most of the patients were compliant with their ASMs. A 93% compliance rate was reported in an Italian study [3], 93.5% in the Saudi study [12], and 96% in Kuwaiti study [22] which is similar to this study.

5. Conclusions

The pandemic appears to have had a mixed effect on PWE depending on the individual profile. In view of the risks involved i.e., seizure exacerbation and precipitation of depression, it is imperative that efforts be made to restore medical care mechanisms for this highly vulnerable population and suitable continuity plans put in place to overcome any disruption in future.

Acknowledgements

We would like to acknowledge Dr David V. Sheehan for permission to use MINI. This work was supported in part by a research grant from All India Institute of Medical Sciences, New Delhi to JK & MT. We would also like to thank Ms Aishani Katyal for her assistance with R software.

Disclosure of conflicts of interest

None of the authors have any conflict of interest to declare.

References

[1] Kuehn BM. Despite improvements, COVID-19’s health care disruptions persist. JAMA 2021; 325(23):2335. doi:10.1001/jama.2021.9134.

[2] World Health Organization. Pulse survey on continuity of essential health services during the COVID-19 pandemic: interim report, 27 August 2020. https://www.who.int/publications/i/item/WHO-2019-nCoV-EHS_continuity-survey-2020-1.

[3] Assenza G, Lanzone J, Brigo F, et al. Epilepsy care in the time of COVID-19 pandemic in Italy: Risk factors for seizure worsening. Front Neurol. 2020;11:737. doi:10.3389/fneur.2020.00737

[4] Albert DVF, Das RR, Acharya JN, Lee JW, Pollard JR, Punia V, et al. The impact of COVID-19 on epilepsy care: A survey of the American Epilepsy Society Membership. Epilepsy Curr 2020;20(5):316–24. https://doi.org/10.1177/153579709956004.

[5] Amudhan S, Gururaj G, Satishchandra P. Epilepsy in India: Epidemiology and public health. Ann Indian Acad Neurol 2015;18(3):263–77. https://doi.org/10.4103/0922-2327.160093.

[6] Delen D, Davazdahmehani B, Eryasroo E, Tomak L, Valluru A. Using predictive analytics to identify drug-resistant epilepsy patients. Health Informatics J 2020;26(1):449–60. https://doi.org/10.1177/1460458219833120.

[7] Britton JW, Shih JJ. Antiepileptic drugs and suicidality. Drug Healthc Patient Saf 2010;2:181–9.

[8] Scott AJ, Sharpe L, Hunt C, Mandy G. Anxiety and depressive disorders in people with epilepsy: A meta-analysis. Epilepsia 2017;58(6):973–82. https://doi.org/10.1111/epi.14379.

[9] Li Q, Chen D, Zhu LN, Wang HJ, Xu D, Tan G, et al. Depression in people with epilepsy in West China: Status, risk factors and treatment gap. Seizure 2019;66:86–92. https://doi.org/10.1016/j.seizure.2019.07.014.

[10] Blaszczynk B, Czuczwar SJ. Epilepsy coexisting with depression. Pharmacol Rep 2016;68(5):1084–92. https://doi.org/10.1016/j.pharep.2016.06.011.

[11] Rashid H, Katyal J, Tripathi M, Sood M, Gupta YK. Validation of the Indian version of Neurological Disorders Depression Inventory for Epilepsy (NDDI-E). Epilepsy Behav 2019;95:75–8. https://doi.org/10.1016/j.yebeh.2019.03.048.

[12] Alkhotani A, Siddiqui MI, Almuntashri F, Baothman R. The effect of COVID-19 pandemic on Iranian patients with epilepsy. Acta Neurol Scand 2020;142(6):545–54. https://doi.org/10.1111/ane.v142.610.1111/ane.v142.611.1111/ane.v142.612.

[13] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China: Lancet 2020;395(10223):497–506. https://doi.org/10.1016/S0140-6736(20)30183-5.

[14] Fonseca E, Quintana M, Lallana S, Luis Restrepo J, Abraira L, Santamarina E, et al. Epilepsy in time of COVID-19: A survey-based study. Acta Neurol Scand 2020;142(6):545–54. https://doi.org/10.1111/ane.14270.

[15] Tedrus GMAS, Silva JFCPD, Barros GS. The impact of COVID-19 on patients with epilepsy. Arq Neuropsiquiatr 2021;79(4):310–4. https://doi.org/10.1590/0004-282X-ANP-2020-0017.

[16] Gui ZR, Atakli HD. Effect of the COVID-19 pandemic on drug compliance and stigmatization in patients with epilepsy. Epilepsy Behav 2021;114(PT A):. https://doi.org/10.1016/j.yebeh.2020.107332.

[17] Ohannessian R, Duong TA, Odone A. Odone global telemedicine implementation and integration within health systems to fight the COVID-19 pandemic: A call to action. JMIR Public Health Surveill. 2020;6(2):e18810. Published 2020 Apr 2. doi:10.2196/18810.

[18] Asadi-Pooya AA, Farazdaghi M, Bazrafshan M. Impacts of the COVID-19 pandemic on Iranian patients with epilepsy. Acta Neurol Scand 2020;142(4):392–5. https://doi.org/10.1111/ane.v142.411.1111/ane.v142.412.

[19] Conde-Blanco E, Centeno M, Tio E, Muriana D, Garcia–Peñas JJ, Serrano P, et al. Emergency implementation of telemedicine for epilepsy in Spain: Results of a...
survey during SARS-CoV-2 pandemic. Epilepsy Behav 2020;111(4):107211. 
[20] Van Hees S, Steewe Pot JN, Wijgelt V, Van den Bergh R, Faria de Moura Villega E, da Silva CF, et al. Access to healthcare and prevalence of anxiety and depression in persons with epilepsy during the COVID-19 pandemic: A multicountry online survey. Epilepsy Behav 2020;112:107350. https://doi.org/10.1016/j.yebeh.2020.107350.
[21] Hao X, Zhou D, Li Z, Zeng G, Hao N, Li E, et al. Severe psychological distress among patients with epilepsy during the COVID-19 outbreak in southwest China. Epilepsia 2020;61(6):1166–73. https://doi.org/10.1111/epi.16544.
[22] Abokalawa F, Ahmad SF, Al-Hashel J, Hassan AM, Arabi M. The effects of coronavirus disease 2019 (COVID-19) pandemic on people with epilepsy (PwE): an online survey-based study. Acta Neurol Belg. 2021; 1-8. doi:10.1007/s13760-021-01609-1.
[23] Mammen KA, Kumar SS. A prospective observational study on depression in epileptic patients. Res J Pharm Technol 2017;10(8):2587. https://doi.org/10.5958/0974-360X.2017.00459.0.
[24] Rashid H, Katyal J, Sood M, Tripathi M. Depression in persons with epilepsy: A comparative study of different tools in Indian population. Epilepsy Behav 2021;115:107633. https://doi.org/10.1016/j.yebeh.2020.107633.
[25] Sheehan DV, Lecrubier Y, Harnett Sheehan K, Janavs J, Weiller E, Keskiner A, et al. The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. Eur Psychiatry 1997;12(5):232–41. https://doi.org/10.1016/S0924-9338(97)83297-X.
[26] Ballester L, Alayo I, Vilagut G, et al. Accuracy of online survey assessment of mental disorders and suicidal thoughts and behaviors in Spanish university students. Results of the WHO World Mental Health- International College Student initiative. PLoS ONE. 2019;14(9):e0221529. doi:10.1371/journal.pone.0221529.
[27] Patten SB, Adair CE, Williams JV, et al. Assessment of mental health and illness by telephone survey: experience with an Alberta mental health survey. Chronic Dis Can 2006;27(3):99–109.
[28] van der Aa HP, Comijs HC, Penninx BW, van Rens GH, van Nispen RM. Major depressive and anxiety disorders in visually impaired older adults. Invest Ophthalmol Vis Sci. 2015;56(2):849-854. doi:10.1167/iovs.14-15848.
[29] Christensen H, Batterham PJ, Grant JB, Griffiths KM, Mackinnon AJ. A population study comparing screening performance of prototypes for depression and anxiety with standard scales. BMC Med Res Methodol. 2011;11:154. doi:10.1186/1471-2288-11-154.
[30] Aziz MA, Kenford S. Comparability of telephone and face-to-face interviews in assessing patients with posttraumatic stress disorder. J Psychiatr Pract 2004;10(5):307–13. https://doi.org/10.1097/00131746-200409000-00003.
[31] Kessler RC, Avenevoli S, Green J, Gruber MJ, Guyer M, He Y, et al. National comorbidity survey replication adolescent supplement (NCS-A): III. Concordance of DSM-IV/CIDI diagnoses with clinical reassessments. J Am Acad Child Adolesc Psychiatry 2009;48(4):386–99. https://doi.org/10.1097/CHI.0b013e31815a1dc.
[32] John C, Weissman MM, Goldstein RB, Adams P, Wickramaratne P, Warner V, et al. Diagnostic interviewing for family studies: comparing telephone and face-to-face methods for the diagnosis of lifetime psychiatric disorders. Psychiatr Genet 1993;3(4):227–34.
[33] Rohde P, Lewinsohn PM, Seeley JR. Comparability of telephone and face-to-face interviews in assessing axis I and II disorders. Am J Psychiatry 1997;154(11):1593–8. https://doi.org/10.1176/jaap.154.11.1593.
[34] Steiger BK, Joket J. Why epilepsy challenges social life. Seizure 2017;44:194–8. https://doi.org/10.1016/j.seizure.2016.09.008.
[35] Szafarski M. Social determinants of health in epilepsy, Epilepsy Behav 2014;41:283–9. https://doi.org/10.1016/j.yebeh.2014.06.013.
[36] Szemere E, Joket J. Quality of life is social–towards an improvement of social abilities in patients with epilepsy. Seizure 2015;26:12–21. https://doi.org/10.1016/j.seizure.2014.12.008.
[37] Lewis G, Kounali D-Z, Button KS, Duffy L, Wiles NJ, Munafò MR, et al. Variation in the recall of socially rewarding information and depressive symptom severity: a prospective cohort study, Acta Psychiatr Scand 2017:135(5):489–98. https://doi.org/10.1111/acps.12729.
[38] Sommerlad A, Marston L, Huntley J, et al. Social relationships and depression during the COVID-19 lockdown: longitudinal analysis of the COVID-19 Social Study [published online ahead of print, 2021 Jan 13]. Psychol Med. 2021;1-10. doi:10.1017/S0033291720000339.
[39] Muskens EM, Lucassen P, Groenleer W, van Weel C, Oude Voshaar R, Speckens ACPS. Psychiatric diagnosis by telephone: is it an opportunity? Soc Psychiatry Psychiatr Epidemiol 2014;49(10):1677–89. https://doi.org/10.1007/s00127-014-0861-9.
[40] Groves RM. Actors and questions in telephone and personal interview surveys. Pub Opin Q 1979;43(2):190–205. https://doi.org/10.1207/s15327957p0808p01.
[41] Szolnoki G, Hoffmann D. Online, face-to-face and telephone surveys—Comparing different sampling methods in wine consumer research. Wine Econ Policy 2013;2(2):57–68. https://doi.org/10.1108/1701201300000091.
[42] Mula M, Sander JW. Negative effects of antiepileptic drugs on mood in patients with epilepsy. Drug Saf 2007;30(7):557–67. https://doi.org/10.2165/00022016-200730070-00001.
[43] Dessie G, Mulugeta H, Leshargie CT, Wagnew F, Burrowes S. Depression among epileptic patients and its association with drug therapy in sub-Saharan Africa: A systematic review and meta-analysis. PLoS One. 2019;14(3):e0202613. doi:10.1371/journal.pone.0202613.
[44] Kanner AM. Depression and epilepsy: a new perspective on two closely related disorders. Epilepsy Curr 2006;6(5):141–6. https://doi.org/10.1177/1535-7511.2006.00125.x.