



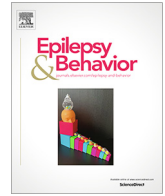
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Impact of COVID-19 pandemic on people with epilepsy: An interventional study using early physical consultation

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ABSTRACT

Background: Telehealth use is limited in developing countries. Therefore, a modified approach with early physical consultation was designed and applied in our hospital. This study aimed to determine the efficacy of this early physical consultation in reducing the clinical and psychological impacts of coronavirus disease-19 (COVID-19), which enabled insight into its global feasibility.

Method: Participants were contacted and offered early physical consultation with a neurologist. Patients who participated in the Phase 1 study on the impacts of the COVID-19 pandemic on people with epilepsy and treated in our hospital were recruited. Clinical and psychological outcomes of COVID-19 were assessed with the Hospital Anxiety Depression Scale (HADS) and Quality of Life in Epilepsy Inventory (QOLIE-31).

Result: A total of 312 patients completed this study with a mean age of 39.13 ± 16.13 years, majority female (51.0%), and experienced seizures at least once yearly (64.7%). There was 12.6% who experienced seizure worsening related to the COVID-19 pandemic. After receiving early clinical intervention, 30.8% achieved better seizure control with another 51.1% had no seizure occurrence. The mean HADS anxiety score improved immediately post-intervention (5.27 ± 4.32 vs. 4.79 ± 4.26 , $p < 0.01$), and at 2-week post-intervention (5.58 ± 4.46 vs. 4.73 ± 3.95 , $p < 0.01$). The mean HADS depression score also improved immediately post-intervention (4.12 ± 3.69 vs. 3.84 ± 3.76 , $p < 0.05$) and at 2-week post-intervention (4.38 ± 3.81 vs. 3.73 ± 3.63 , $p < 0.05$). The intervention resulted in significant improvement in energy-fatigue and social function subscales in QOLIE-31 but a reduction in cognitive and medication effects subscales.

Conclusion: Early physical consultation with stringent precautionary measures is feasible and effective in improving the psychological outcome during COVID-19 pandemic.

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1. Introduction

The novel coronavirus disease-19 (COVID-19) pandemic has caused unprecedented societal disruption worldwide with severe repercussions to the healthcare system and economy [1]. The implementation of mandatory social distancing and lockdown as precautionary measures was vital to quell the spread of COVID-19 [2], but it also creates a unique barrier for patients seeking medical care, including epilepsy care. Healthcare visits in Malaysia were disrupted and postponed, similar to other countries, leading to unprecedented loss of access to medical attention as well as medication supply, affecting the psychological well-being and quality of life [3,4]. Tough decisions were made daily to allocate

finite resources to contain COVID-19 spread while providing continuous quality care to patients and keeping hospitals open.

Telehealth programs have shown significant satisfaction and quality from both patient and physician standpoints in developed countries [5,6]. The delivery of complex epilepsy care, including to patients with refractory epilepsy has been demonstrated with comparable outcomes to face-to-face visits [7,8]. A recent United States of America survey by an urban quaternary care hospital on the use of telehealth by pediatric neurologists suggested its feasibility and effectiveness for a large proportion of neurology care with further strategies needed to ensure equitable telehealth use [9]. In the United States of America, 67% of outpatients' visits were completed via telehealth, 32% with telephone visits, and only 1% were in-person clinic visits [10].

However, telehealth visits were not ideal for every outpatient encounter [10]. A recent study suggests that patients were negatively affected by the adoption of telehealth due to lack of internet

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access and/or video-capable devices, resulting in unsatisfactory interaction or necessitated in-person visits [11], which is a more challenging issue in resource-limited countries. There were other barriers, such as the inability to perform clinical examinations, diagnostic monitoring, and laboratory tests [12]. Furthermore, the confidential transmission of medical information through a secure network remains a major ethical concern [5]. The quality of patient–physician interaction was potentially undermined by the remote nature of telehealth visits. Certain topics can be challenging to discuss without the basis of trust in a patient–physician relationship, more so in a reserved Asian culture [5,13].

Therefore, developing countries with reduced access to the internet and electronic devices need another viable option to ensure patient's well-being at a minimal cost. To the best of our knowledge, there was no study on other feasible healthcare delivery methods, especially in resource-limited settings. We have developed an early physical clinic consultation strategy for people with epilepsy in our hospital. We aimed to determine the feasibility and efficacy of this early physical clinic consultation in reducing the clinical and psychological impacts of COVID-19.

2. Methodology

2.1. Sampling and framework

This is a pre-post interventional study. A total of 426 patients, 18 years and above, who had participated in our phase 1 study on the impacts of COVID-19 pandemic on people with epilepsy and treated in University Malaya Medical Centre (UMMC) were recruited with a participation rate of 90%. Those who refused or unable to provide consent, or without a history of seizures were excluded. This recruitment was conducted since 7 June 2020 for a duration of 1 month, 134 days after the first COVID-19 case was confirmed in Malaysia and 81 days since the implementation of lockdown, with a reported 8, 663 cumulative cases as of July 5. The invitation links to online questionnaires were sent via short messages (SMS), email, or Facebook. Patients with epilepsy in the clinic were also approached physically with a participation rate of 90%. This study was approved by the University Malaya Medical Ethics Committee (MECID. No. 202056-8601), and written consent was obtained.

2.2. Intervention

Participants who were treated in our hospital (UMMC) and completed phase 1 survey on the impact of COVID-19 on people with epilepsy [4], were contacted via SMS or email and offered an option to have early physical clinic consultation with a neurologist within 3 days. The early physical consultation was conducted in person and not using telemedicine. The process was similar to usual clinic consultation but at an earlier date of at least 6 months than their scheduled postponed appointments. During the in-person clinical consultation, the patient's immediate health concerns especially those related to the postponement of clinic appointments were addressed appropriately, and this was expected to improve the clinical and psychosocial outcomes. Issues discussed, but not limited to, were related to seizure control, their AED dosages, its side effects, and other forms of epilepsy management.

2.3. Measures

In our phase 1 study [4], participants received an invitation link to an online Google form comprising structured questions on demographic data, clinical, logistic, and psychological impacts of

COVID-19. Psychological impacts were assessed through the Hospital Anxiety and Depression Scale (HADS) and Quality of Life in Epilepsy Inventory (QOLIE-31). Following the consultation session, the patients answered a set of questionnaires immediately for changes in psychological outcomes, using HADS. A 2-week follow-up survey was performed to determine the seizure control and psychological outcomes, using HADS and QOLIE-31. A short follow-up (2-week) was planned to detect the effect of early consultation, but not the medication effects.

2.3.1. Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety Depression Scale (HADS) is used as a tool to measure anxiety and depression in patients with general medical conditions [14]. It is a 14-item self-administered questionnaire consists of two subscales, anxiety and depression. The subscale of anxiety focused on symptoms of generalized anxiety disorder and the subscale of depression focused on anhedonia, and the main symptoms of depression. Each item is scored on a response-scale with four alternatives ranging between 0 and 3. The responses are summed to obtain the total score for each subscale. The total score for each subscale was then categorized into normal (0–7), and abnormal – borderline (8–10), and definite (11–21). HADS was validated in the epilepsy cohort, age 18 years and above, with high internal consistency reported for HAD-Anxiety (Cronbach's $\alpha = 0.88$) and HAD-Depression (Cronbach's $\alpha = 0.82$) [15].

2.3.2. Quality of Life in Epilepsy Inventory (QOLIE-31)

The QOLIE-31 has been widely cited as a reliable instrument (Cronbach's $\alpha = 0.93$) to assess epilepsy-related QOL [16]. It is a 31-item self-administered questionnaire clustered in seven subscales in the following domains: seizure worry (five items), emotional well-being (five items), energy/fatigue (four items), cognitive functioning (six items), medication effects (three items), social functioning (five items), and overall QOL (two items). The seven subscales generate a QOLIE-31 overall score representing the overall epilepsy-related quality of life. Each subscale and the overall score range from 0 to 100, with higher scores indicating better wellbeing.

2.4. Operational definition

Baseline seizure frequency was defined as the frequency of seizures in the previous 12 months before the COVID-19 outbreak. Seizure control during the COVID-19 period was determined based on the changes in seizure frequency, duration, or severity. In view of short follow-up (2-week), we measured only the subjective reported changes in seizure control, rather than exact seizure frequency. Seizure worsening during the COVID-19 pandemic was defined by an increase in seizure frequency, duration, or severity, as reported in our phase 1 study [4]. Seizure improvement after the intervention was defined by a reduction in seizure frequency, duration, or severity.

2.5. Analyses and results

Statistical analysis using IBM® SPSS® Statistics software (version 25.0) was performed with a significance level defined at 0.05. Sample size was calculated to achieve an alpha level of 0.05, power of 0.95 in a two-tailed matched pairs *t*-test, and 0.20 in effect size (Cohen's *d*). A minimum of 327 samples was needed to achieve these parameters. All demographic data were analyzed descriptively, with nominal data presented as frequencies and percentages and continuous data presented as means and standard variations. For comparison of the psychological measures between pre-and post-intervention, one-way repeated measures ANOVAs were used to determine the significance of the differences.

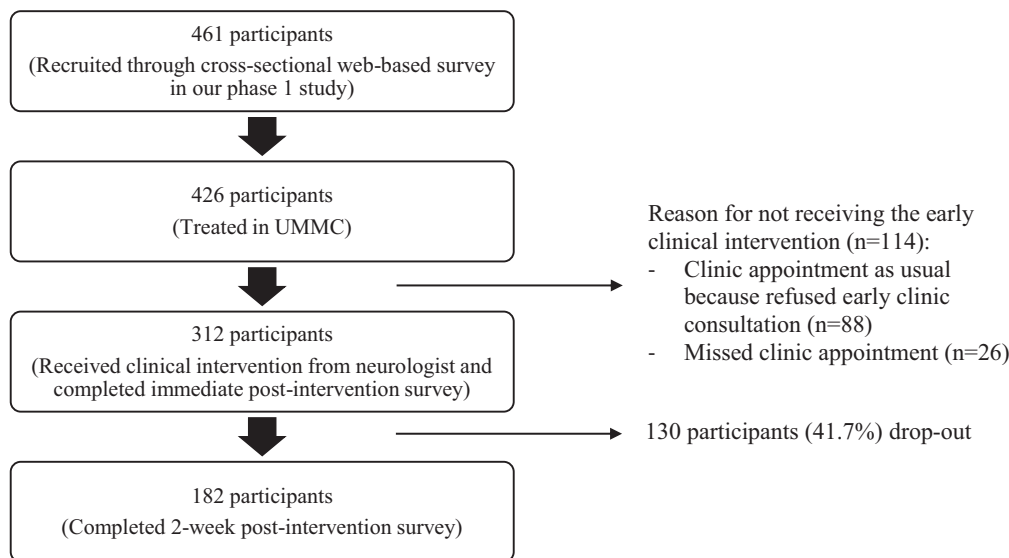


Fig. 1. The flow chart of the recruitment process.

Table 1 Sociodemographic and clinical characteristics comparison between the participants and the dropouts (N = 312), and non-participants (N = 114).

	Total (n = 312)	Respondent at 2-week follow-up (n = 182)	Dropout (n = 130)	Non-participants (n = 114)
Age (Year), Mean ± SD	39.13 ± 16.13	38.29 ± 15.14	40.30 ± 17.40	41.50 ± 15.28
	N (%)			
Gender				
Male	153 (49.0)	95 (52.2)	58 (44.6)	56 (49.1)
Female	159 (51.0)	87 (47.8)	72 (55.4)	58 (50.9)
Race				
Malay	97 (31.1)	57 (31.3)	40 (30.8)	34 (29.8)
Chinese	130 (41.7)	81 (44.5)	49 (37.7)	59 (51.8)
Indian	80 (25.6)	39 (21.4)	41 (31.5)	18 (15.8)
Native	2 (0.6)	2 (1.1)	0 (0.0)	0 (0.0)
Others	3 (1.0)	3 (1.6)	0 (0.0)	3 (2.6)
Marital Status				
Single	188 (60.3)	112 (61.5)	76 (58.5)	53 (46.5) ^b
Others	124 (39.7)	70 (38.5)	54 (41.5)	61 (53.5)
Highest Education Attained				
Postgraduate	4 (1.3)	4 (2.2)	0 (0.0)	6 (5.3) ^b
Degree	73 (23.4)	45 (24.7)	28 (21.5)	33 (28.9)
Post-secondary	43 (13.8)	27 (14.8)	16 (12.3)	25 (21.9)
Secondary	141 (45.2)	77 (42.3)	64 (49.2)	42 (36.8)
Primary	27 (8.7)	16 (8.8)	11 (8.5)	3 (2.6)
No formal education	24 (7.7)	13 (7.1)	11 (8.5)	5 (4.4)
Employment Status				
Full-time student	28 (9.0)	18 (9.9)	10 (7.7)	5 (4.4)
Employed full-time	101 (32.4)	58 (31.9)	43 (33.1)	49 (43.0)
Employed part-time	15 (4.8)	10 (5.5)	5 (3.8)	3 (2.6)
Full-time house duties/Housewife	13 (4.2)	7 (3.8)	6 (4.6)	6 (5.3)
Retired	43 (13.8)	24 (13.2)	19 (14.6)	18 (15.8)
Unemployed	112 (35.9)	65 (35.7)	47 (36.2)	33 (28.9)
Seizure control				
Frequency of seizures before COVID-19 outbreak				
No seizure for at least a year				
Less than once a month	110 (35.3)	52 (28.6)	58 (44.6) ^a	46 (40.4)
One or more seizures a month	113 (36.2)	71 (39.0)	42 (32.3)	41 (36.0)
Clinical outcome				
Seizure Worsening* (Pre-intervention)				
Yes	36 (11.5)	23 (12.6)	13 (10.0)	18 (15.8)
No	276 (88.5)	159 (87.4)	117 (90.0)	96 (84.2)

^a p-Value <0.05 between the respondent at 2-week follow-up and the dropouts.

^b p-Value <0.05 between the participants and non-participants.

* Seizure worsening is defined as an increase in seizure frequency, duration, or severity.

Table 2
Seizure changes during COVID-19 period and with intervention (N = 182).

	Seizure changes due to COVID, n (%)	Seizure changes with intervention, n (%)
Seizure frequency		
More frequent	20 (11.0)	8 (4.4)
No change	54 (29.7)	37 (20.3)
Less frequent	39 (21.4)	41 (22.5)
I have no seizure	69 (37.9)	96 (52.7)
Seizure duration		
Longer	6 (3.3)	6 (3.3)
No change	76 (41.8)	42 (23.1)
Shorter	27 (14.8)	39 (21.4)
I have no seizure	73 (40.1)	95 (52.2)
Seizure severity		
More severe	12 (6.6)	3 (1.6)
No change	69 (37.9)	43 (23.6)
Less severe	30 (16.5)	38 (20.9)
I have no seizure	71 (39.0)	98 (53.8)
Seizure Worsening due to COVID pandemic*		
Yes	23 (12.6)	-
No	90 (49.5)	-
No seizure occurrence	69 (37.9)	-
Seizure Improvement with intervention**		
Yes	-	56 (30.8)
No	-	33 (18.1)
No seizure occurrence	-	93 (51.1)

* Seizure worsening is defined by an increase in seizure frequency, duration, or severity during the COVID period.

** Seizure improvement is defined by a reduction in seizure frequency, duration, or severity, after the intervention.

3. Results

3.1. Recruitment process and clinic-demographic characteristics

Of the 461 participants enrolled in the cross-sectional web-based survey pre-intervention, only 426 were treated in UMMC. A total of 312 participants received the clinical intervention and completed the immediate post-intervention survey, while the others were followed up as usual or missed clinic appointments. The mean age was 39.13 ± 16.13 years, and 51.0% were female, majority Chinese (41.7%), single (60.3%), with secondary education level or lower (61.6%), and 37.2% employed. Eighty-nine (28.5%) have baseline seizures frequency ≥1 per month. None of our patients or their caretakers reported being infected with SARS-CoV-2 at the time of data collection. Participants (N = 312) were more likely to be single (60.3% vs. 46.5%, p < 0.05) and with secondary education level or lower (61.6% vs. 43.8%, p < 0.05) than the non-participants (N = 114).

Table 3
Psychological outcome comparison between pre-, immediately post-, and 2-week post-intervention.

Time period	N	Mean ± SD		Wilks' Lambda	F	Effect Size	p ¹	p ²	
		Pre-intervention	Post-intervention						
			Immediately						2-week
HADS Anxiety	312	5.27 ± 4.32	4.79 ± 4.26	-	0.97	(1, 311) 10.99	0.03	0.001	-
	182	5.58 ± 4.46	4.90 ± 4.43	4.73 ± 3.95	0.92	(2, 180) 7.93	0.08	-	0.001
Depression	312	4.12 ± 3.69	3.84 ± 3.76	-	0.98	(1, 311) 5.24	0.02	0.023	-
	182	4.38 ± 3.81	4.09 ± 3.86	3.73 ± 3.63	0.96	(2, 180) 3.45	0.04	-	0.034

¹ p-value for the difference between pre-and immediately post-intervention.

² p-value for the difference between pre-, immediately and 2-week post-intervention.

At 2-week follow-up, 182 responded with a drop-out rate of 41.7% (N = 130), of which 125 did not complete the 2-week survey and 5 withdrew from the study. The drop-out respondents were more likely to have seizure freedom as compared to those who responded (44.6% vs. 28.6%, p < 0.05), but had no significant differences in the other clinical and socio-demographic characteristics (Fig. 1 and Table 1).

3.2. Clinical outcome of intervention during COVID-19 period

In total, 12.6% experienced seizure worsening, with either an increase in seizure frequency, duration, or severity before having clinical intervention during the pandemic. However, after the clinical intervention, 30.8% of patients reported improvement in their seizure control with an increasing group of patients having less frequent, shorter, and less severe seizures. Ninety-three patients (51.1%) do not experience any seizure within the 2 weeks following the clinical intervention (Table 2).

3.3. Psychological outcome of intervention during COVID-19 period

Repeated measures ANOVA showed that the mean HADS anxiety score improved immediately post-intervention (5.27 ± 4.32 vs. 4.79 ± 4.26, p < 0.01), and at 2-week post-intervention (5.58 ± 4.46 vs. 4.73 ± 3.95, p < 0.01). The mean HADS depression score also improved immediately post-intervention (4.12 ± 3.69 vs. 3.84 ± 3.76, p < 0.05) and at 2-week post-intervention (4.38 ± 3.81 vs. 3.73 ± 3.63, p < 0.05) (Table 3, Fig. 2).

Subanalysis was performed by categorizing the HADS score into normal, borderline, and abnormal. After the clinical consultation, the total number of patients with borderline and abnormal anxiety scores reduced from 28.0% to 26.0% immediately and 22.5% at 2-week post-intervention, whereas the number of patients with depression reduced from 21.4% to 17.5% immediately and 13.7% at 2-week post-intervention (Table S1, supplementary information).

The early clinical intervention had resulted in statistically significant improvement on energy/fatigue (6.87 ± 2.06 at pre- vs. 7.20 ± 2.15 at post-intervention, p < 0.05) and social function (12.68 ± 4.68 at pre- vs. 14.43 ± 4.63 at post-intervention, p < 0.05) subscales. However, there were a worsening in the cognitive (15.95 ± 6.16 at pre- vs. 15.19 ± 5.94 at post-intervention, p < 0.05) and medication effects (1.63 ± 0.39 at pre- vs. 1.45 ± 0.85 at post-intervention, p < 0.05) subscales (Table 4).

4. Discussion

A total of 12.6% experienced seizure worsening during the COVID-19 pandemic but 30.8% experienced better seizure control after an early clinical consultation with a healthcare professional.

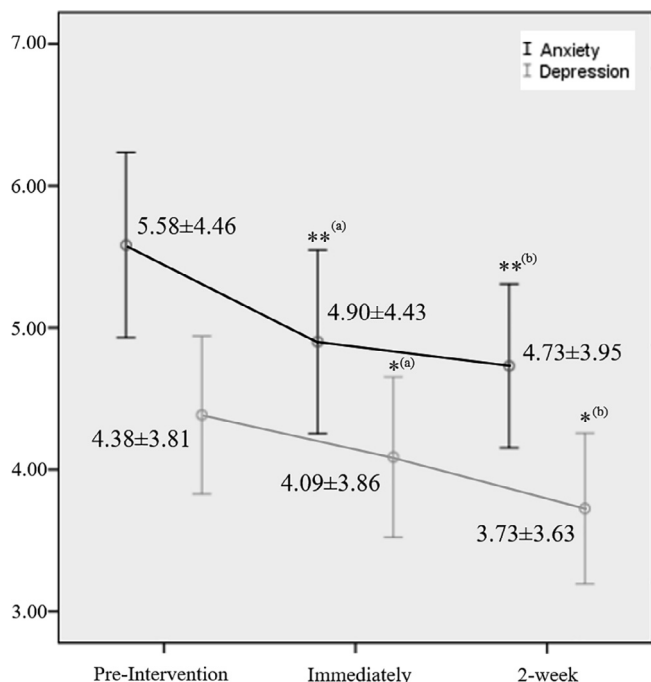


Fig. 2. Changes in anxiety and depression levels with intervention (N = 182) P-value for the differences between pre- and (a) immediately post-intervention, and (b) 2-week post-intervention. * p-Value <0.05; ** p-value <0.01.

Psychologically, there were improvements in anxiety and depression, as well as certain subscales in quality of life. This could be attributed to receiving much-needed medical attention and adjustment of their AED dosages, assessment of its side effects and psychological comorbidities, or solving the logistic issues related to the COVID-19 pandemic such as drug supply. A recent telemedicine study on pediatric patients with epilepsy in Italy reported similar clinical outcomes through a health follow-up, by monitoring the patient’s disease trajectory and behavior during the pandemic as well as its success in alleviating concerns [17].

People with epilepsy experienced seizure worsening, anxiety, and depression during a pandemic, including Malaysia [4,18–20]. In the USA, more than 40% reported significant difficulty in reaching their epilepsy healthcare provider for medical attention [21]. Our findings support the need to improve patient’s accessibility to medical services especially during lockdown or movement restriction period.

Telehealth has become a necessity during this pandemic to reduce physical encounters and limit exposure [5,6]. However, it is not accessible in most less developed countries [22]. The need for strong internet connection and video-capable devices for uti-

lization of telehealth platforms poses a challenge for patients with limited financial resources. The struggle for digital inclusion might result in the marginalization of non-technology users including the elderly and patients with lower socioeconomic status [22]. Actions need to be taken to accelerate much-needed health service reform, especially to enable accessible care even to the rural and underprivileged communities with no access to the internet. In our study, contacting the patients and offering early clinic appointments as needed, was shown to be a feasible method. This approach provided uninterrupted healthcare through physical face-to-face consultation while adhering to strict safety precautions and social distancing. Health concerns including clinical, logistics, and psychological impacts of COVID-19 identified in Phase 1 were addressed [4]. Although telehealth remains the most promising future of healthcare delivery, patient’s preference, and acceptability of the delivery modality remain an utmost priority to ensure adherence to management plans.

The clinical intervention resulted in improvements in both energy-fatigue and social function subscales of quality of life, possibly as a result of improved psychological state [23]. However, the worsening in medication effect and cognitive subscales could be attributed to the resumption of previous higher AED dosages or the change in AED regime [23].

4.1. Limitations

As the pre-post study was conducted in urban and semi-rural areas, the findings may not be representative of the rural or underprivileged settings. Future studies involving these underprivileged communities should be conducted to assess their continuity of care in a resource-limited driven setting. In view of the short (2-week) follow-up, a social desirability effect in the psychological measures may be present. Adding a comparison group will minimize this bias; however, it is technically difficult in this pandemic. For seizure control, it is technically difficult to measure a change in the exact seizure frequency in 2-week follow-up. Therefore, in this study, we measured only the subjective reported changes in seizure control, rather than exact seizure frequency. The drop-out rate (42%) was high, likely because they were clinically stable and thus had less interest to respond to the 2-week survey. In the comparison between the respondents and dropouts, there were no significant differences in the clinical and socio-demographic characteristics, except the dropouts were mostly seizure free or having infrequent seizures.

4.2. Implications

It is vital to put in place sustainable structures that will allow accessibility to healthcare services and medication supply. Active self-management together with constant engagement with medical care is crucial in minimizing the burden associated with both

Table 4
Changes in quality of life (QOLIE-31) with intervention (N = 182).

Time period	Mean ± SD		Wilks’ Lambda	F (2, 180)	Effect Size	p-value
	Pre-intervention	2-week Post-intervention				
QOLIE-31						
Overall Score	59.54 ± 15.51	60.98 ± 15.67	0.98	3.11	0.02	0.080
Seizure Worry	3.72 ± 2.31	3.59 ± 2.28	1.00	0.91	0.01	0.340
Overall Quality of Life	9.26 ± 2.64	9.42 ± 2.32	0.98	3.18	0.02	0.76
Emotional Well-being	9.59 ± 2.70	9.82 ± 2.83	0.99	1.35	0.01	0.247
Energy/Fatigue	6.87 ± 2.06	7.20 ± 2.15	0.98	4.28	0.02	0.040
Cognitive	15.95 ± 6.16	15.19 ± 5.94	0.97	5.24	0.03	0.023
Medication Effects	1.63 ± 0.39	1.45 ± 0.85	0.95	9.03	0.05	0.003
Social Function	12.68 ± 4.68	14.43 ± 4.63	0.85	31.27	0.15	0.000

chronic mental disorders and with epilepsy. Although telehealth service is not commonly used in less developed countries and has its limitation, an effort to make it user-friendly and accessible to suitable patients should be attempted.

5. Conclusion

Early physical consultation with stringent precautionary measures is effective in improving the psychological outcomes during the COVID-19 pandemic. This study highlights the importance of the continuation of epilepsy care during the COVID-19 pandemic and provides insight on an alternative approach besides telemedicine during the COVID-19 pandemic, especially in a resource-limited setting.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.yebeh.2021.108215>.

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