



## Implementation of Virtual Consultations for Epilepsy during the COVID-19 Pandemic among Neurologists in Saudi Arabia

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## ABSTRACT

**Background:** To reduce disease exposure, telemedicine has been used to help healthcare systems that have been faced with challenges since the COVID-19 outbreak in managing emergency departments, outpatient care clinics and providing ongoing care to those with chronic illnesses such as epilepsy. **Objectives:** The aim of this study is to assess the emergency implementation of virtual consultations among neurologists in Saudi Arabia in the wake of the COVID-19 pandemic. **Methods:** A cross-sectional study was conducted from August to September 2020 in survey format distributed electronically to neurologists practicing in Saudi Arabia. Descriptive and correlative statistical analyses were performed to identify factors associated with onsite and virtual clinic visits in those treating patients with epilepsy. **Results:** A total of 92 neurologists participated in the study. The majority of neurologists (75%) care for COVID-19 patients along with their regular clinic duties. There was statistical significance between the duration of the virtual visit in comparison to the onsite clinic visit and the neurologists' views on the future of teleneurology for epilepsy patients ( $G^2(4, N = 92) = 18.673, p = 0.001$ ). **Conclusion:** Virtual consultations have been a way to decrease personal contact and disease exposure since the start of the COVID-19 pandemic. For those suffering with chronic conditions such as epilepsy, telemedicine may be a useful resource in following up with a neurologist and medication changes may be successfully made.

**Keywords:** Telemedicine, virtual consultation, COVID-29, Epilepsy

## 1. INTRODUCTION

As of August 30, 2020, close to 25 million cases of COVID-19 have been diagnosed worldwide and approximately 800,000 mortalities have been reported since the start of the pandemic in January 2020 (Organization, 2020). To reduce disease exposure, telemedicine has been used to help healthcare systems that have been faced with challenges since the outbreak in managing emergency departments, outpatient care clinics and providing ongoing care to those with chronic illnesses (Rockwell & Gilroy, 2020) such as epilepsy. A chronic central nervous system disease that is estimated to affect 50 million people worldwide, epilepsy patients require long term follow up for continuity of care by a neurologist (Beghi *et al.*, 2019). According to the World Health Organization report on epilepsy, those living with the condition require access to clinicians and anti-seizure medications in order to decrease the disease burden and improve the quality of life of those affected (Epilepsy, 2019). Virtual epilepsy clinics in the era of COVID-19 have allowed clinicians to evaluate patients in the safety of their own homes without unnecessary exposure to or increased anxiety regarding SARS-Co-V-2 and this may also lead to increase in compliance to remote follow up visits (Lavin *et al.*, 2020).

Research regarding the effectiveness of telemedicine in Saudi Arabia in general is limited and regarding teleneurology is nonexistent. A study conducted in Riyadh, Saudi Arabia during 2019 revealed that clinicians have little knowledge on telemedicine technology although a great majority believed that telemedicine could be an effective method of patient-physician contact (Albarrak *et al.*, 2019). Another study conducted in the Eastern region of Saudi Arabia showed that despite governmental funding for telemedicine modalities, there seemed to be low interest by health care providers to adopt the virtual medicine technologies (El-Mahalli *et al.*, 2012). The aim of this study is to assess the emergency implementation of virtual consultations among neurologists in Saudi Arabia in the wake of the COVID-19 pandemic.

## 2. METHODOLOGY

A cross-sectional study was conducted from August to September 2020 in survey format distributed electronically to neurologists practicing in Saudi Arabia. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Medicine at King Abdulaziz University in Jeddah, Saudi Arabia and the guidelines outlined in the Declaration of Helsinki were followed. All neurologists who participated in the study gave full written consent and were assured anonymity.

Components of the survey included age group of the respondent, clinic type, whether the neurologist had the additional task of caring for COVID-19 patients along with their other clinic tasks, average number of epilepsy patients per week, likelihood of medication regimen changes during virtual visits compared to onsite clinic visits, duration of virtual visits in comparison to onsite clinic visits, personal opinions regarding the future of teleneurology for those with epilepsy, the presence of administrative support to organize remote visits and the rate of technical difficulties in communicating with patients during teleconsultations.

The survey data used to support the findings of this study are available upon request from the corresponding author. Statistical analysis was done using IBM SPSS Statistics Version 20. The level of significance, (*P*- value), was taken at < 0.05. The Likelihood ratio

(LR) chi statistic and Pearson Chi statistic were applied to measure variable independence. The Bonferroni correction was used in post hoc testing of the data.

### 3. RESULTS

A total of 92 neurologists participated in the study. The most common age group of the participants was >35-45 years of age (33.7%) with the least being those between 25-35 years old (18.5%). Most neurologists (70.7%) operated non-specialized epilepsy clinics. Detailed demographic information can be found in Table 1.

**Table 1:** Demographic Information of Study Participants

Demographics	
Age group	n (%)
25-35 years	17/92 (18.5)
>35-45 years	31/92 (33.7)
>45-55 years	24/92 (26.1)
>55 years	20/92 (21.7)
Type of Clinic	n (%)
Monographic Epilepsy Clinic	27/92 (29.3)
Non Specialized Epilepsy Clinic	65/92 (70.7)

The majority of neurologists (75%) care for COVID-19 patients along with their regular clinic duties. More than half (55.4%) reported that the duration of their virtual consultations with patients are usually shorter than onsite clinic visits and 42.4% are weary to change medication regimens during virtual visits. 35.9% of neurologists still prefer face to face consultations over virtual visits. Although 71.1% sometimes faced technical difficulties during virtual consultations, almost two thirds of neurologists reported that the virtual appointments were administratively organized. Detailed survey responses may be found in Table 2.

**Table 2:** Emergency Implementation of Virtual Consultations for Epilepsy Survey Results

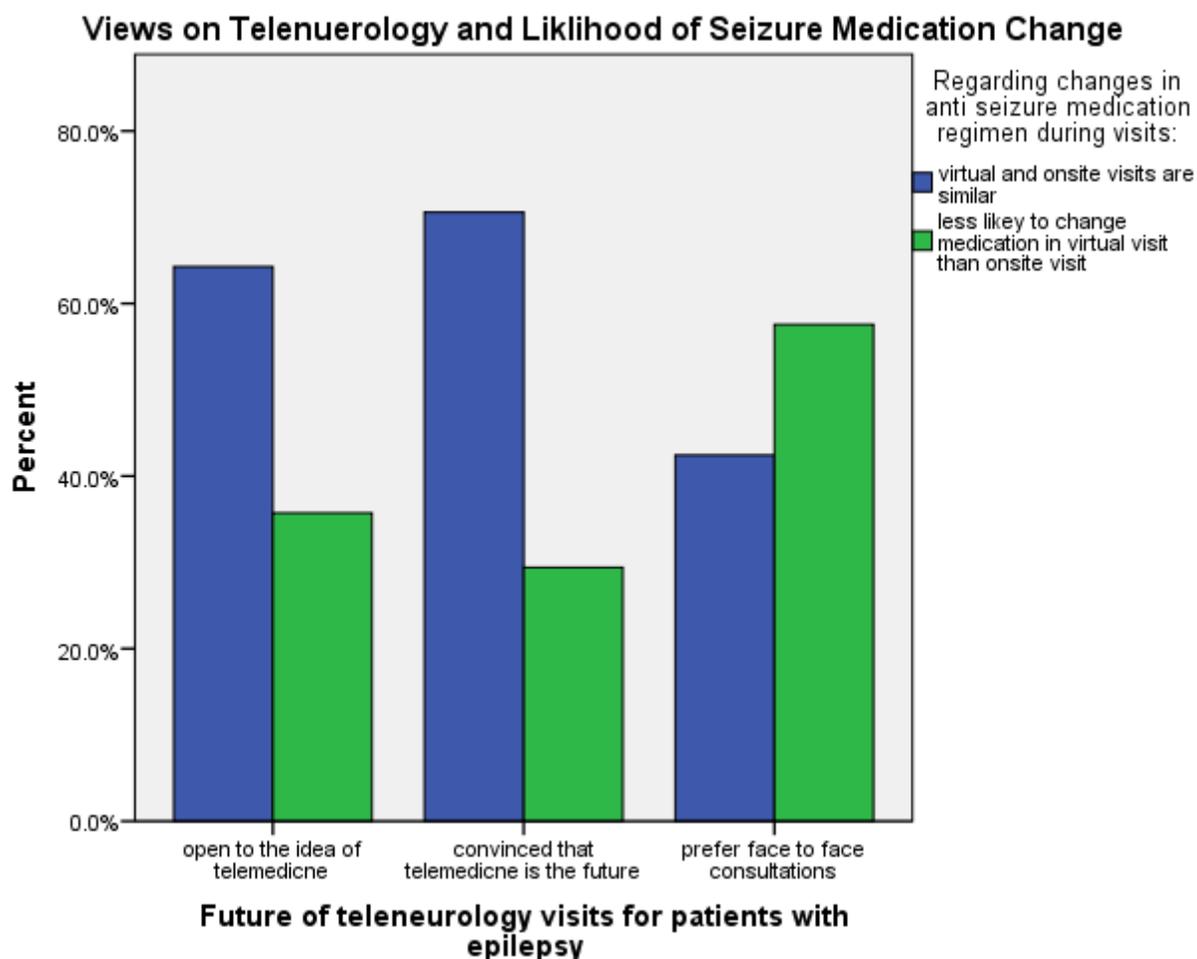
Survey Questions:	
Do you care for COVID-19 patients along with your regular clinic duties?	n (%)
Yes	69/92 (75)
No	23/92 (25)
How many epilepsy patients on average do you assess per week?	n (%)
Less than 10 patients	34/90 (37.8)
10 to 20 patients	29/90 (32.2)
More than 20 patients	27/90 (30)
Regarding medication regimen changes:	n (%)
There is no difference between virtual and onsite visits	53/92 (57.6)
I am less likely to change medication regimen during the virtual visit than the onsite visit	39/92 (42.4)
Regarding the duration of the virtual consultations:	n (%)
They take as much time as the onsite clinic visit	22/92 (23.9)
They are shorter than the onsite clinic visit	51/92 (55.4)
They are longer than the onsite clinic visit	19/92 (20.7)
Do you see a future for virtual neurology consultations for those with epilepsy?	n (%)
I am open to the idea	42/92 (45.7)
I am convinced that virtual medicine is applicable	17/92 (18.5)
I prefer face to face consultations	33/92 (35.9)
Who organized the virtual visits?	n (%)
Self-organization	30/92 (32.6)
Administrative organization	62/92 (67.4)
How often do you face technical difficulties in communicating with your patients during the virtual consultations?	n (%)

Sometimes	64/90 (71.1)
Rarely	15/90 (16.7)
Never	11/90 (12.2)
*Percentages may not equal 100% due to rounding	

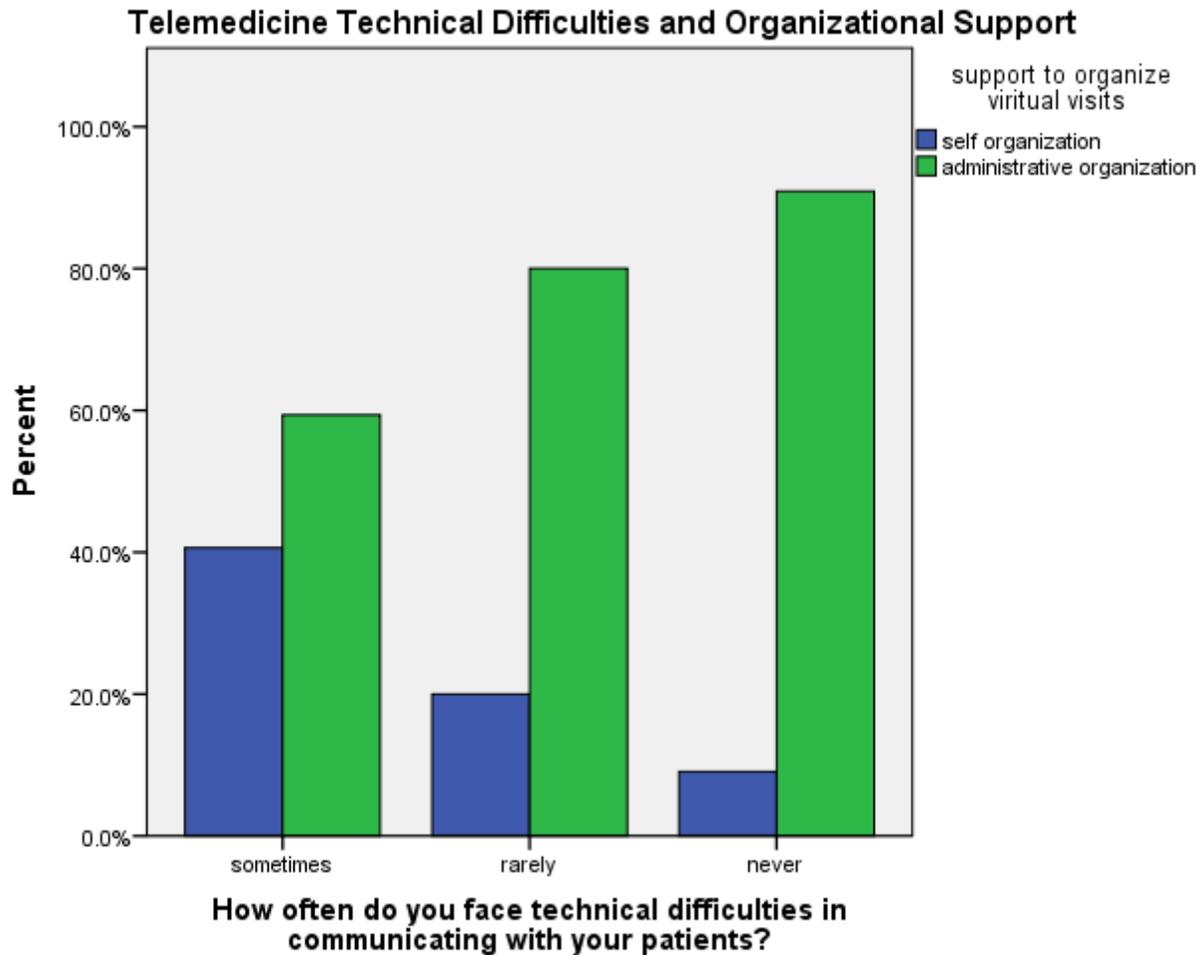
The likelihood ratio (LR) chi statistic was significant for duration of virtual visit in comparison to the clinic visit and the age group of the respondents ( $G^2(6, N = 92) = 12.840, p = 0.046$ ). However, upon further statistical examination using the Bonferroni correction with an adjusted significance value of  $p = 0.004$  during the post hoc testing, there was no significant difference between age group and visit duration. The same consequence was found for the Pearson chi square statistic between duration of visit and likelihood of changing medications between virtual and onsite clinic visits being statistically significant ( $X^2(2, N = 92) = 8.786, p = 0.012$ ), while post hoc testing with the adjusted Bonferroni significance value of  $p = 0.008$  showed there was no difference (figure 1).

Of the 19 neurologists who responded that virtual visits take longer than onsite visits, only one (5.3%) was above 55 years of age. 17.6% of those that responded that virtual visits took less time than onsite visits were between 25-35 years if age with the majority being between 35-45 years (41.2%). 40.9% of those that responded there was no difference in duration between the virtual or onsite visits were above 55.

There was statistical significance between the duration of the virtual visit in comparison to the onsite clinic visit and the neurologists' views on the future of teleneurology for epilepsy patients ( $G^2(4, N = 92) = 18.673, p = 0.001$ ). Using the Bonferroni correction of  $p = 0.0056$ , there was statistical significance for those that spent the same amount of time during virtual and onsite clinic visits and were open to the idea of telemedicine ( $G^2(1, N = 17) = 3.4, p = 0.0006$ ). Those that prefer face to face consultations were found take a longer time during the virtual visit than the onsite clinic visit ( $G^2(1, N = 12) = 2.8, p = 0.0054$ ). Neurologists that took less time during their virtual visits compared to the onsite clinic visits, did not have statistically significant Bonferroni adjusted significance values regarding the future of teleneurology (figure 2).



**Figure 1:** views on teleneurology and likelihood of seizure medication change.



**Figure 2:** telemedicine technical difficulties and organizational support

#### 4. DISCUSSION

During the difficult time of the global pandemic caused by COVID-19, telemedicine technology has demonstrated that for those with epilepsy, it is a practical tool of facilitating virtual physician- patient interactions (Brigo *et al.*, 2020). The majority of participants (75%) had the additional task of caring for patients affected by COVID-19 along with their regular clinic duties. Although less than one third of the neurologists who participated in the study were specialized epileptologists, 97.8% (90/92) see patients with epilepsy weekly. Surprisingly, 67.4% of telemedicine encounters were administratively organized; it was found that 71.1% sometimes faced technical difficulties in communicating with their patients. This may indicate that better organization and technological support and training is needed to enhance the telemedical experience for the physician and patient so that it will be seen as a substitute to onsite clinic visits rather than an additional service (von Wrede *et al.*, 2020).

There was statistical significance for the duration of virtual visit in comparison to the clinic visit and the age group of the respondents ( $p = 0.046$ ). However, upon further statistical examination using the Bonferroni correction with an adjusted significance value of  $p = 0.004$  during the post hoc testing, there was no significant difference between age group and visit duration. The Bonferroni correction was used to adjust for type 1 error however at the expense of increasing the probability of type 2 error, or a false negative (Andrade, 2019). The same was found between duration of visit and likelihood of changing medications between virtual and onsite clinic visits being statistically significant ( $p = 0.012$ ), while post hoc testing with the adjusted Bonferroni significance value of  $p = 0.008$  showed there was no difference. Studies have shown that telemedicine is as effective as onsite consultations regarding medication compliance and seizure control (Bahrani *et al.*, 2017; Reider-Demer *et al.*, 2018). It has also been demonstrated that telemedicine encounters are usually shorter but more frequent than onsite clinic visits (Bertoncello *et al.*, 2018).

Notably, neurologists who spent as much time on virtual consultations as onsite clinic visits, were open to the idea of telemedicine ( $p = 0.0006$ ). Those that spent longer time on virtual visits preferred face to face patient visits ( $p = 0.0054$ ). This

finding could point to lack of clinician's experience with telemedicine technology therefore influencing the effectiveness of this innovative intervention (Bertoncello *et al.*, 2018).

The study was limited by not assessing all neurologists across Saudi Arabia and not reaching those in resource poor areas where teleneurology may not have influenced their daily practice.

## 5. CONCLUSION

Virtual consultations have been a way to decrease personal contact and disease exposure since the start of the COVID-19 pandemic. For those suffering with chronic conditions such as epilepsy, telemedicine may be a useful resource in following up with a neurologist and medication changes may be successfully made. Clinicians should be better trained in the technology in order to better serve their respective communities. Further studies are needed in Saudi Arabia regarding the impact of telemedicine and its reach to those in rural and resource poor communities.

### Contributors' Statement

Dr. Reem Alyoubi conceptualized and designed the study and critically reviewed and reviewed the manuscript for intellectual content.

Dr. Sumayyah Ahmed Nezar Kobeisy carried out the data analysis and reviewed and revised the manuscript.

Dr. Ahmed Alkady, Dr. Mashael Ibrahim Bamusa, Dr. Seham Matar Alotaibi and Dr. Sulaiman Alhindi designed the data collection instrument, collected the data and conceptualized and designed the study.

Dr. Osama Yousef Muthaffar, Dr. Ahmed Khamis Bamaga, Dr. Naseem Y. Alyahyawi and Dr. Huda Y. Alyahyawi reviewed and revised the manuscript.

### Conflict of Interest Disclosures (includes financial disclosures)

The authors have no conflicts of interest to disclose.

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### Informed consent

Informed consent was obtained from all individual participants included in the study.

### Ethical approval

The study was approved by the Medical Ethics Committee of King Abdulaziz University (ethical approval code: HA-02-J-008).

### Data and materials availability

All data associated with this study are present in the paper.

### Peer-review

External peer-review was done through double-blind method.

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