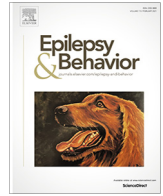




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Brief Communication

Impact of COVID-19 on seizure-related emergency attendances and hospital admissions – A territory-wide observational study ☆☆☆☆☆

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ABSTRACT

This is a territory-wide study to investigate the impact of coronavirus disease 2019 (COVID-19) pandemic on Accident and Emergency Department (A&E) attendances and acute ward admissions for seizures. Adult patients who presented to the A&E with seizures from January 23, 2020 to March 24, 2020 (study period) were included and compared with parallel intervals from 2015 to 2019 (control periods). Preexisting time trend in control periods and potential changes during COVID-19 were analyzed by Poisson, negative and logistic regression models.

Accident and Emergency Department attendances and ward admissions for seizures decreased significantly during the COVID-19 pandemic. A total of 319 and 230 recorded ward admissions and A&E attendances for seizures were identified during the study period in 2020, compared with 494 and 343 per annum, respectively in the control periods. The ratio of acute ward admission per A&E attendance for seizures did not change significantly. Intensive care utility and mortality rates remained stable.

For some patients, delaying medical attention due to fear of nosocomial COVID-19 cross-infection may lead to severe or even life-threatening consequences. This change in medical help-seeking behavior calls for new medical care models to meet the service gap. Education to patients with epilepsy and their caregivers is of utmost importance during this pandemic.

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1. Introduction

Seizure is a common reason for utilization of emergency hospital services. It is among the top neurological conditions for hospital admission [1]. The outbreak of the coronavirus disease 2019 (COVID-19) has quickly evolved from a regional epidemic to a global pandemic. This has imposed a huge challenge on healthcare systems around the world. The first case of COVID-19 in Hong Kong was confirmed on January 23, 2020 [2]. This led to a series of emergency infection protocols in public hospitals in our locality [3]. There is increasing concern that these measures might have

impacted patients' health-seeking behavior for non-COVID-19 conditions, particularly chronic diseases. We hypothesized that COVID-19 had affected the utility of emergency medical service of patients with seizures. By analyzing data from a territory-wide computerized database, we compared the Accident and Emergency Department (A&E) attendance and ward admissions of patients for seizures before and during the outbreak of COVID-19.

2. Methods

2.1. Data source

Data were retrieved from the central computerized database of Clinical Data Analysis and Reporting System (CDARS) of the Hong Kong Hospital Authority (HA). The HA is the sole operator of public hospitals in the territory. It provides service through seven hospital clusters and covers about 90% of all secondary and tertiary care in a population of around 7.4 million. The HA manages 18 public acute hospitals with A&E. Among them, 14 hospitals are using the International Classification of Diseases 9 (ICD9) code for encoding the diagnosis of each A&E attendance. All 18 acute hospitals are using

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ICD9 code for encoding diagnosis of each acute ward admission. The diagnosis codes and other admission data are recorded in the CDARS.

2.2. Case and outcome definitions

The study period was between January 23, 2020 and March 24, 2020. Control periods were the parallel intervals, from January 23 to March 24, from year 2015 to 2019. The lunar New Year holiday in Hong Kong, usually in late January/early February, may transiently affect the local admission rate. However, the periods of interest completely covered the holiday in all the 6 years included, thereby controlling for any possible impact of this factor in the analysis. The population of Hong Kong was stable at around 7.4 million during the years of study.

For both A&E attendance and acute ward admission cases, eligible patients were adults aged 18 years or above with a principal diagnostic label of “Epilepsy” (ICD9 345.0–345.9) or “Convulsions” (ICD9 780.3). Nonemergency admissions were excluded. The ratio of acute ward admissions was obtained by dividing the number of acute ward admissions for seizures by the number of A&E attendance for seizures. Several outcome measures were compared and analyzed. The lengths of stay (LOSs) in the acute ward, High Dependence Unit/Intensive Care Unit (HDU/ICU), and rehabilitation wards were recorded as the total days spent in each unit during each admission. Mortality rate was the proportion of patients who died during admission for the aforementioned ICD codes in the study period. Early A&E reattendance and acute ward readmission rates were defined as such within 28 days. The data from the

study period were then compared with those in the control periods.

2.3. Statistical analysis

Poisson regression and negative binomial regression were used to analyze the trend of hospitalization parameters of patients with seizure in the period of interest. Logistic regression was performed to study the mortality risk, acute ward readmission, and A&E reattendance rates. We accounted for preexisting time trend and examined potential change during the study period after COVID-19 outbreak in 2020. Statistical analysis was performed with IBM SPSS 22.0 for Windows and R version 3.6.3 (R Development Core Team, Vienna, Austria). Statistical significance is considered at $P < 0.05$.

2.4. Ethics approval

This study was approved by the institutional review board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster. Informed consent was waived by the board as the clinical data were anonymized.

3. Results

A total of 319 eligible acute ward admissions were identified in the COVID-19 study period, while 2469 admissions were recruited in total from the control periods from 2015 to 2019. The background yearly trend was relatively stable (Fig. 1) (adjusted relative

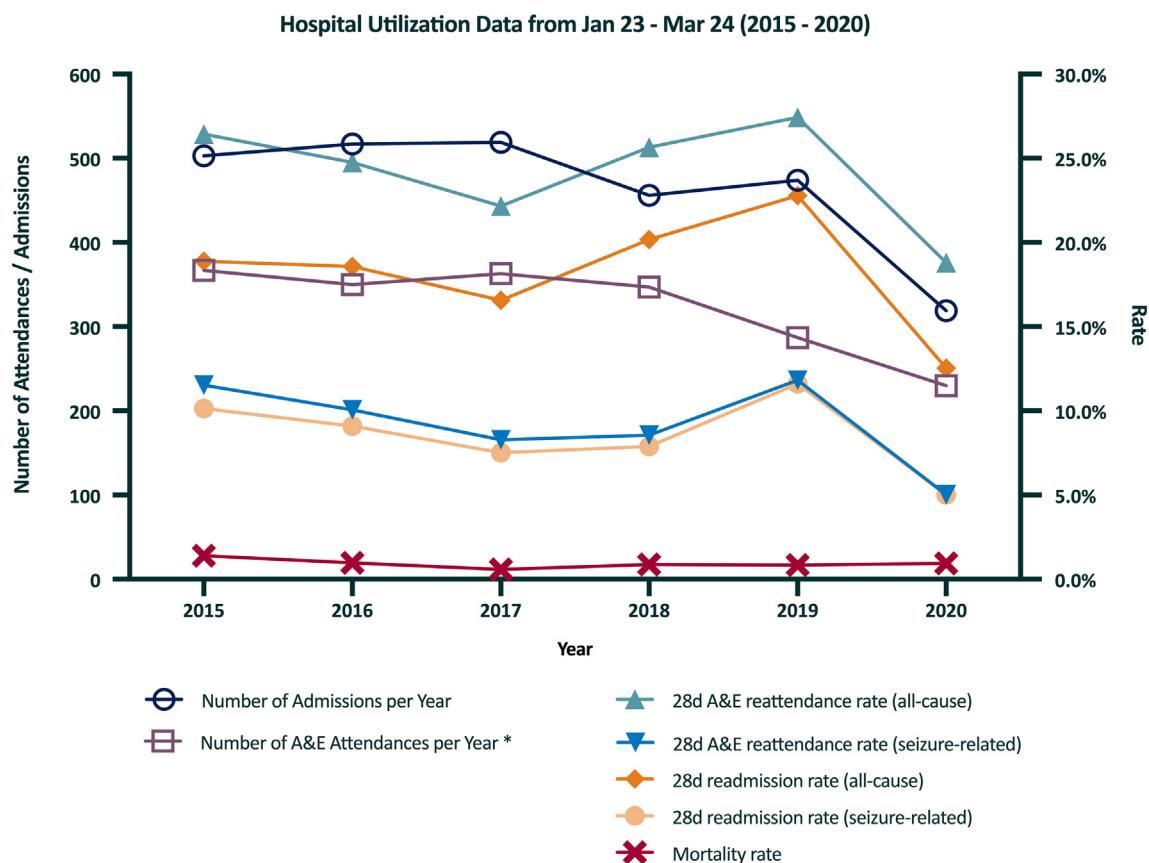


Fig. 1. Hospital utilization during study period from 2015 to 2020.

risk (aRR): 0.98, 95% confidence interval (CI): 0.95–1.00, $P = 0.09$). An evident drop in acute ward admissions for seizure was noted in the study period during the COVID-19 pandemic (aRR: 0.70, 95% CI: 0.60–0.80, $P < 0.001$) (Table 1). A total of 230 eligible A&E attendances for seizure were identified during the COVID-19 study period, while 1714 attendances in total were found during the control periods from 2015 to 2019. A similar drop was observed in A&E attendance. Significant reduction was demonstrated in the study period (aRR: 0.78, 95% CI: 0.65–0.92, $P = 0.003$) on the top of background gradual declining trend (aRR: 0.95, 95% CI: 0.92–0.99, $P = 0.005$) (Table 1 and Fig. 1). Ratio of acute ward admissions for seizures per A&E attendance did not change significantly within the study period (aRR: 1.27, 95% CI: 0.81–2.01, $P = 0.309$) (Fig. 1).

Utilization and total time spent in A&E observation room showed a significant decrease during the COVID-19 pandemic (Table 1). There was a significant drop in LOSs in acute wards and rehabilitation wards in the time trend (Table 1). The LOSs in HDU/ICU for seizure remained stable. Mortality risk associated with seizures also did not have significant change in the study period. Early A&E reattendances (for seizure) and acute ward readmissions (for both seizure and all causes) all demonstrated a significant decline (Table 1 and Fig. 1).

4. Discussion

This is a territory-wide observational study to investigate the impact of COVID-19 pandemic on the medical help-seeking behavior by patients with seizure. It specifically examined the hospital service utility parameters including hospital attendances and admissions, LOS, and early readmission rates.

In the medical system of Hong Kong, a patient with an emergent condition usually first presents to the A&E. An emergency specialist will triage the patient to acute ward, A&E observation room, or direct discharge [4]. Our results showed significant reduction in acute ward admissions for seizures after the outbreak. This could be attributed to two potential reasons. First, there might have been a change in medical health-seeking behavior among patients with seizure. Second, there might have been a change in admission threshold of acute seizure case among the emergency specialists. The former reason is more likely as demonstrated by a similar fall in A&E attendances for seizures. Ward admission criteria by emergency specialists have arguably been unchanged by the pandemic. There has been no official change in local and international professional guidelines in triaging patients with seizure at A&E. This was reflected by a largely similar ratio of acute ward admission per A&E

Table 1

Overall trends and changes during the COVID-19 pandemic of measures of admissions & hospital utilization (N = 2788).

	aRR/aOR	95% CI	P-value
Acute ward admission			
Time trend (per year)	0.98	0.95–1.00	0.090
COVID-19 pandemic	0.70	0.60–0.80	<0.001
LOS in acute general ward			
Time trend (per year)	1.05	1.03–1.08	<0.001
COVID-19 pandemic	0.80	0.70–0.93	0.003
LOS in ICU/HDU (N = 87)			
Time trend (per year)	0.94	0.80–1.10	0.413
COVID-19 pandemic	0.94	0.46–1.94	0.867
LOS in rehabilitation wards (N = 45)			
Time trend (per year)	1.19	0.97–1.44	0.127
COVID-19 pandemic	0.12	0.05–0.29	<0.001
Mortality rate			
Time trend (per year)	0.88	0.65–1.18	0.381
COVID-19 pandemic	1.54	0.29–7.09	0.588
28-Day A&E reattendance rate (all-cause)			
Time trend (per year)	1.10	0.95–1.08	0.668
COVID-19 pandemic	0.66	0.46–0.93	0.020
28-Day A&E reattendance rate (seizure)			
Time trend (per year)	0.99	0.90–1.09	0.810
COVID-19 pandemic	0.49	0.26–0.87	0.018
28-Day readmission rate (all-cause)			
Time trend (per year)	1.06	0.99–1.14	0.103
COVID-19 pandemic	0.50	0.33–0.75	<0.001
28-Day readmission (seizure)			
Time trend (per year)	1.01	0.90–1.13	0.853
COVID-19 pandemic	0.61	0.30–1.19	0.158
A&E attendance ^a			
Time trend (per year)	0.95	0.92–0.99	0.005
COVID-19 pandemic	0.78	0.65–0.92	0.003
Utilization of A&E observation room ^a			
Time trend (per year)	0.82	0.76–0.89	<0.001
COVID-19 pandemic	0.50	0.27–0.86	0.017
Total minutes used in A&E observation room (N = 316)			
Time trend (per year)	0.87	0.86–0.87	<0.001
COVID-19 pandemic	0.55	0.53–0.58	<0.001
Ratio of acute ward admission per A&E attendance ^a			
Time trend (per year)	1.09	1.01–1.18	0.038
COVID-19 pandemic	1.27	0.81–2.01	0.309
28-Day A&E reattendance (all-cause) ^a			
Time trend (per year)	1.01	0.93–1.10	0.790
COVID-19 pandemic	0.86	0.55–1.32	0.492
28-Day A&E reattendance rate (seizure) ^a			
Time trend (per year)	0.92	0.79–1.07	0.276
COVID-19 pandemic	1.25	0.55–2.77	0.591

aRR = adjusted relative risk; aOR = adjusted odd ratio; CI = confidence interval.

^a Analysis only included hospitals with electronic data available (N = 1944).

attendance this year. Although public hospital management has reviewed the provision of nonurgent services such as elective admissions and procedures, the policy for emergency services has theoretically been maintained.

A shortened mean LOSs in acute and rehabilitation wards for patients with seizure was noted after the COVID-19 outbreak. Both clinicians and patients might prefer to minimize the hospital stay once the patient's condition has been stabilized. This, however, did not lead to increased rates of early rehospitalization or readmission. The mortality rate and the length of HDU/ICU stay was largely comparable with the baseline. This may reflect that the occurrence of severe conditions associated with seizure was not altered by the pandemic.

Change in medical help-seeking behavior among patients may be multifactorial. Fear of nosocomial cross-infection of COVID-19 and avoidance to overload the hospital system may be some of the reasons [5]. Although such concerns are understandable, delay in seeking medical attention may be at the expense of optimal and timely investigation and management. Seizure or epilepsy per se has not been shown to increase the risk of COVID-19 infection. Theoretical risk may apply to those who have epileptic disorders associated with syndromal, comorbid, and therapy-related deficiencies in the immune system. The International League Against Epilepsy (ILAE) advises that patients with seizure may spare a visit to A&E only if there is absence of life-threatening features or complications [6]. However, patients who were managed at home may experience a lower quality of life, because of disruption of normal social services and provision of public facilities.

The enormous societal impact of the COVID-19 pandemic has provided a strong impetus to reflect and evaluate our healthcare systems and to put forward innovative and comprehensive medical care models to address any unmet demands. For example, telemedicine has recently attracted great attention, with evidence to support its use in groups with epilepsy [7,8]. While this technology may be common in some parts of the world, it is still not popular in population-dense localities such as Hong Kong with convenient accessibility to healthcare. Cultural and habitual differences may also be hurdles among clinicians and patients. However, especially with social distancing measures in effect, the low cost and feasibility of telecommunications may be an effective alternative to traditional medical consultation for patients with seizure and epilepsy. Moreover, the role of other healthcare practitioners such as epilepsy specialist nurses could be strengthened. They may serve an important role in addressing healthcare needs, patient, and caregiver education; monitoring drug adherence; and providing psychosocial support [9]. Epileptic seizures are likely to be recurrent, and symptomatic seizures can have their precipitating factors worsen if not treated timely. Hence, it is possible that the medically unattended cases will emerge when the pandemic eases. Continuous survey for any rebound in admission rate could confirm this postulation.

This study has limitations. Patients with seizure presentation belong to a heterogeneous group. They include first-ever seizures, either unprovoked or with apparent precipitating causes, and breakthrough seizure of known epilepsy disorders. We are unable to perform subgroup analysis in different causes of seizure. We are also unable to capture the seizure severity of each episode from the electronic database. It is possible that only patients with more sev-

ere seizures attended the A&E during the pandemic. Presentations to primary care for possibly milder seizures were not included in the analysis. We assumed that the incidence of seizure in the population was not affected by COVID-19 pandemic. Although the occurrence of certain provoked seizures (e.g., due to alcohol consumption, head trauma) may have been reduced with social lockdown, the COVID-19 virus itself is unlikely to substantially alter the risk of seizure occurrence. Preventive measures such as face mask, social distancing, quarantine, and travel restriction should have remote effects if any.

5. Conclusions

Our study demonstrated a significant drop in A&E attendances and acute ward admissions for seizures during the COVID-19 pandemic in Hong Kong. This could probably be explained by a change in patients' medical help-seeking behavior, although further study is needed to understand the role of other factors including lifestyle and use of community-based care. For some patients, delaying medical attention because of fear of nosocomial cross-infection of COVID-19 may lead to severe or even life-threatening consequences. Education to patients with epilepsy and their caregivers are of utmost importance during this pandemic. Novel medical care models should be explored to meet the emerging service gap.

Ethical publication statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

Declaration of competing interest

None of the authors has any conflict of interest to disclose.

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