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Research Article

Effect of COVID 19 Pandemic on Stroke Care and Admission - Single Centre Study

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Abstract

Background

By the start of the year 2020, the whole world was attacked by a rapidly spreading epidemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which later was classified by WHO as Pandemic. Some physicians reported multiple neurological manifestations including cerebrovascular strokes in patients with severe infection.

Aim

to assess the incidence of admitted stroke cases during 2019 in comparison to 2020 during the COVID-19 pandemic in King Fahd Hospital, Saudi Arabia.

Methodology

A record based retrospective comparative study was conducted by reviewing all medical records for patients who were admitted with stroke at King Fahd Hospital during March and April 2019 and March and April 2020. All data were extracted from patients' medical files and included personal data, nationality, date of admission, and stroke related data.

Results

The study included 121 patients whose ages ranged from 33 to 98 years with a mean age of 59.9 years. In March 2019, there were 45 cases compared to 26 in March 2020. In April 2019 there were 20 admitted stroke cases compared to 30 in April 2020. Regarding clinical features of admitted stroke cases, Table 3 illustrates that 36.9% of stroke cases in 2019 were small vessel stroke compared to 58.9% of 2020 cases.

Conclusions & Recommendations

In conclusion, the study revealed there was no recorded significant change in the trend of admitted cases with stroke before and during the COVID-19 pandemic.

Keywords:
Stroke; cerebrovascular accident; COVID-19; seasonal; comparison; trend

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Background

By the end of the year 2019 and start of 2020, the world was faced by a rapidly spreading epidemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which later was classified by WHO as Pandemic.[1] The outbreak started in Wuhan, Hubei province, China, in December 2019. The World Health Organization (WHO) classified the disease as a Public Health Emergency of International Concern on 30 January 2020 and recognized it as a pandemic on 11 March 2020.[2],[3]

Recently, some physicians reported multiple neurological manifestations including cerebrovascular strokes in patients with severe infection.[4] So far, there are many reported cases of COVID-19 presenting with strokes in the literature.

Most patients with stroke need immediate hospital admission as their neurological condition may worsen within the first few days, they may develop non-neurological complications such as aspiration pneumonia, and urgent investigations (like CT scan) may be crucial.[5] During the COVID-19 pandemic, all priorities were given for COVID-19 cases as the pandemic flow of cases may exceed the health care system capacity. This was at the expense of many other non COVID cases who need emergent hospitalization including stroke cases. Up till now, physicians reported different clinical features for COVID-19 cases. Stroke may be one of the first presenting features.[6] The current study aimed to assess the incidence of admitted stroke cases during March and April 2019 in comparison to March and April 2020 during the COVID-19 pandemic in King Fahd Hospital - Jeddah, Saudi Arabia.

Methodology

A record based retrospective comparative study was conducted by reviewing all medical records for patients who were admitted with stroke at King Fahd Hospital during March and April 2019 and March and April 2020. All data were extracted from patients' medical files and included personal data, nationality, and date of admission. Stroke related data included mechanism of stroke, stroke territory,

and acute therapy given. Comparison at admitted case rate between 2019 and 2020 was considered based on date of admission.

Data analysis

After data were extracted, they were revised, coded and fed to statistical software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including student's personal data and stroke clinical data. Crosstabulation was used to assess compare the incidence and different clinical features for stroke cases during 2019 and 2020 (COVID-19 pandemic). Pearson chi-square and Exact probability test were used to test for distribution difference significance.

Results

The study included 121 patients whose ages ranged from 33 to 98 years with mean age of 59.9 12.5 years. During the year 2019, 20% of the stroke cases were aged less than 50 years compared to 16.1% during the year 2020. Also, 27.7% of the cases during 2019 were aged 70 years or more compared to 12.5% of stroke cases in 2020. As for gender, the majority of cases were males in 2019 and 2020 (67.7% and 62.5%, respectively). Saudi patients constituted 55.4% of 2019 cases compared to 57.1% of 2020 cases. All these differences were found to be statistically insignificant (Table 1).

(Table 2) demonstrates the incidence rate of stroke cases during March and April during years 2019 and 2020. In March 2019, there were 45 cases compared to 26 in March 2020. In April 2019 there were 20 admitted stroke cases compared to 30 in April 2020. These differences in cases distribution were found to be statistically significant (P=.011). These findings were illustrated in more details in a line graph (Figure 1) which showed the distribution of admitted stroke cases per date of admission. The graph showed decreased trend in the number of admitted cases from 2019 to 2020.

Table 1. Personal data of patients with stroke in King Fahd Hospital - Jeddah, Saudi Arabia.

Personal data		**Year**				**P-value**
		2019		2020		
		No	%	No	%	
Age in years						*.133*
< 50 years	22 (18.2%)	13	20.0%	9	16.1%	
50-59	39 (32.2%)	17	26.2%	22	39.3%	
60-69	35 (28.9%)	17	26.2%	18	32.1%	
70+	25 (20.7%)	18	27.7%	7	12.5%	
Gender						*.550*
Male	79 (65.3%)	44	67.7%	35	62.5%	
Female	42 (34.7%)	21	32.3%	21	37.5%	
Nationality						*.846*
Saudi	68 (56.2%)	36	55.4%	32	57.1%	
Non-Saudi	53 (43.8%)	29	44.6%	24	42.9%	

P: Pearson X^2 test

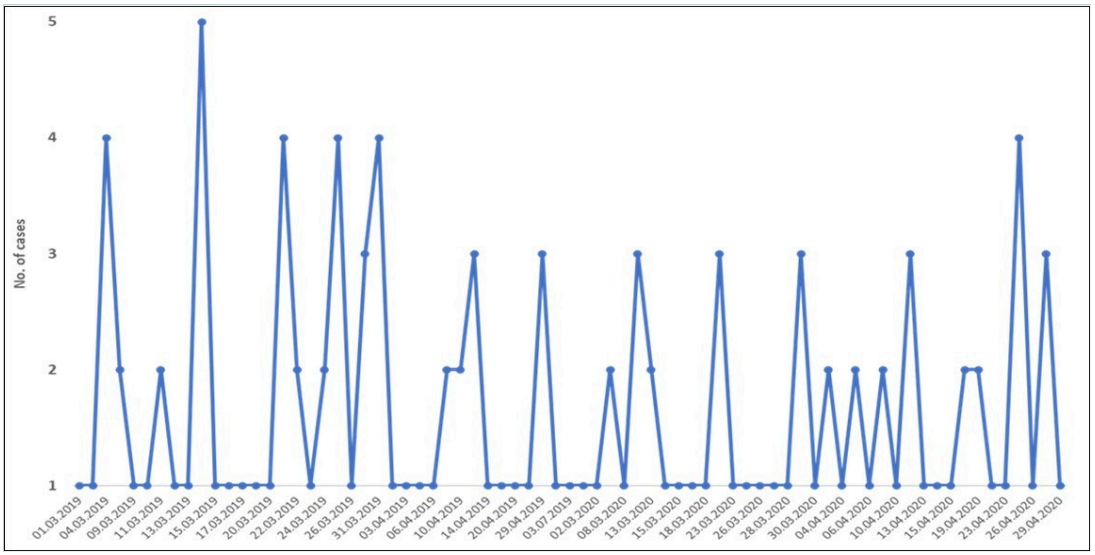


Figure 1. Frequency time series chart for stroke cases in King Fahd Hospital - Jeddah, Saudi Arabia.

Table 2. Distribution of stroke cases according to month and year of diagnosis

Month	Year				P-value
	2019		2020		
	No	%	No	%	
March	45	69.2%	26	46.4%	
April	20	30.8%	30	53.6%	*.011**
Total	65	100.0%	56	100.0%	

P: Pearson X^2 test, * P < 0.05 (significant)

Regarding clinical features of admitted stroke cases, Table 3 illustrates that 36.9% of stroke cases in 2019 were small vessel stroke compared to 58.9% of 2020 cases. Also, large vessel stroke was diagnosed among 30.8% of 2019 cases compared to 28.6% of 2020 cases. One case with vasculitis was diagnosed among 2020 cases. This was associated with statistical significance (P=.007). Regarding stroke territory, MCA was the affected vessel in 68.3% of 2019 cases compared to 53.8% of 2020 cases. ACA was affected among 1.7% of 2019 cases compared to 28.2% of 2020 cases (P=.001). As for acute therapy, IV tPA was given for 7.7% of 2019 cases compared to 5.4% of 2020 cases while 3.1% of 2019 cases underwent mechanical thrombectomy compared to none of 2020 cases (P=.356).

Discussion

COVID-19 is the new pandemic striking the whole world since the initials of 2020. The common symptoms of COVID-19 include fever, cough, shortness of breath and sometimes develops into pneumonia. It may cause severe complications in persons with immunodeficiency, the elderly, and persons with chronic diseases such as cancer, diabetes and lung diseases.[7] The most frequent symptoms of COVID-19 are like those of other viruses that attack the respiratory system. However, while some people develop mild or no symptoms, others have no choice but to seek treatment at hospital. Loss of smell, dizziness, and rash were of the reported symptoms of COVID-19 cases. Cardiovascular blood clotting also a problem identified among cases with confirmed COVID-19 infection.[8]

Table 3. Distribution of stroke data among cases by date in King Fahd Hospital - Jeddah, Saudi Arabia.

Stroke data		Total (%)	Year				P-value
			2019		2020		
			No	%	No	%	
Stroke type	Bilateral cerebellar and old ischemic	1 (0.8%)	0	0.0%	1	1.8%	.007*
	Cardioembolic	6 (5.0%)	3	4.6%	3	5.4%	
	Large vessel	36 (29.8%)	20	30.8%	16	28.6%	
	Not known	20 (16.5%)	18	27.7%	2	3.6%	
	Small vessel	57 (47.1%)	24	36.9%	33	58.9%	
	Vasculitis	1 (0.8%)	0	0.0%	1	1.8%	
Stroke territory	MCA	62 (62.6%)	41	68.3%	21	53.8%	.001*
	ACA	12 (12.1%)	1	1.7%	11	28.2%	
	PCA	10 (10.1%)	5	8.3%	5	12.8%	
	ICA	9 (9.1%)	6	10.0%	3	7.7%	
	Vertebral	7 (7.1%)	7	11.7%	0	0.0%	
	Basilar	11 (11.1%)	6	10.0%	5	12.8%	
Acute therapy	None	111 (91.7%)	58	89.2%	53	94.6%	.356
	IV tPA	8 (6.6%)	5	7.7%	3	5.4%	
	IV tPA + mechanical thrombectomy	2 (1.7%)	2	3.1%	0	0.0%	

P: Exact probability test, * P < 0.05 (significant)

The current study aimed to compare the incidence of admitted stroke cases in King Fahd Hospital – Jeddah, Saudi Arabia during 2019 with the incidence during the same months in 2020 in concordance with COVID-19 pandemic. The study revealed that the total number of stroke cases admitted in King Fahd hospital during March and April 2019 was 65 cases compared to 56 cases in 2020. This decreased trend may be explained by that all hospitals including the current study hospitals give the priority for COVID-19 cases who presented with the classical signs and symptoms. So, stroke cases as a clinical feature of COVID-19 infection are mostly misdiagnosed and were not admitted. The trend shown in Figure 1 indicates minimal non-significant reduction in the admitted cases. Regarding demographic features of admitted cases during the two time periods (2019 vs. 2020), no significant difference was recorded which means no discrimination was done. Regarding clinical features of stroke, the most recorded type of stroke during 2019 was due to small and large vessels affection (more than two thirds of the cases). More than half of the cases during 2020 were due to small vessel affection besides one case with vasculitis. Regarding affected artery, MCA was the most affected during 2019 and 2020 admissions. Among cases admitted at 2020, ACA was the second most diagnosed affected artery compared to only one case in 2019. As for acute therapy given for the cases, more than 90% of the stroke cases admitted to the hospital in 2020 had no acute therapy and none of them underwent mechanical thrombectomy compared to 89% and 3.1% for cases admitted during 2019, respectively. This confirms the theory that even the cases were admitted, surgical intervention was limited, and emergency care may be delayed due to the overload on hospitals because of a high rate of COVID-19 cases. Figure 2.

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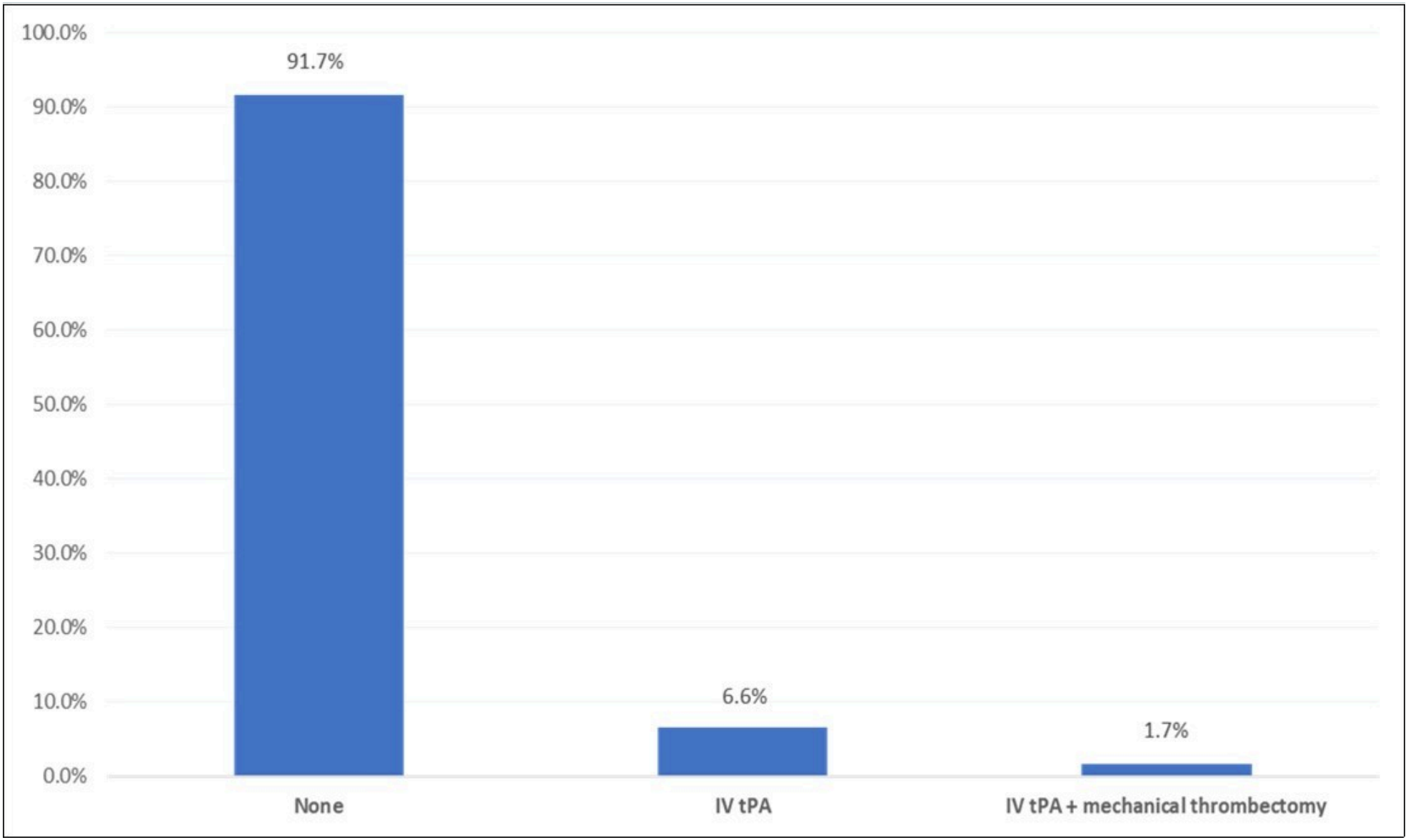


Figure 2. Acute therapy for stroke cases in King Fahd Hospital - Jeddah, Saudi Arabia.

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This issue of connecting COVID-19 infection with the probability of having stroke was addressed by Oxley et al.[6] The authors reported five cases of large-vessel stroke in patients younger than 50 years of age who presented to our health system in New York City. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection was diagnosed in all five patients. Klok et al. assessed incidence of thrombotic complications in critically ill ICU patients with COVID-19. [9] The study was conducted by evaluating the incidence of the composite outcome of symptomatic acute pulmonary embolism (PE), deep-vein thrombosis, ischemic stroke, myocardial infarction or systemic arterial embolism among all COVID-19 cases admitted to the ICU of two Dutch university hospitals and one Dutch teaching hospital. The incidence of the composite outcome was 31%, of which CTPA and/or ultrasonography confirmed VTE in 27% and arterial thrombotic results in 3.7%. PE was the most diagnosed thrombotic complication (n = 25, 81%). COVID-19 presenting as stroke was reported by Avula et al.[10] Researchers searched all hospitals database to find patients that presented with acute stroke and concomitant features of suspected COVID-19 infection. Four identified patients who presented with radiographic confirmation of acute stroke and PCR-confirmed SARS-CoV-2 infection. We elucidate the clinical characteristics, imaging findings, and the clinical course.

Limitations of the Study

Despite the novelty of the topic, there are some reported limitations. First, the study was conducted in only one hospital which may affect study conclusion generalizability, but it is the available hospital due to lockdown and pandemic precautions. Second, the reported incidence during 2020 may be underestimated due to overutilization of hospitals and resources for classical COVID-19 infections and stopping deal with cold or even some emergent cases in the study hospital.

Conclusions and Recommendations

In conclusion, the study revealed that there was no recorded significant change in the trend of admitted cases with stroke before and after COVID-19 pandemic. The reported differences were in the affected arteries and type of stroke. Although habitually considered a lung disease, COVID-19 has been reported to cause blood clots that can lead to severe stroke. Experts say that this can happen in any patients regardless of age, and even in those with few or no symptoms. COVID-19 may cause both venous and arterial thromboembolism because of excessive inflammation, hypoxia, immobilisation, and diffuse intravascular coagulation. Reports on the incidence of thrombotic complications are however not highly available. More large-scale studies are required to confirm the relation between COVID-19 and stroke attacks.

Competing Interests

We have no conflicts of interest to disclose.

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