ORIGINAL RESEARCH

Admissions for stroke and strategies to optimize healthcare delivery during the covid-19 pandemic - experience from a tertiary care hospital

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ABSTRACT

Introduction: The COVID-19 pandemic has influenced every aspect of healthcare and the general functioning of populations. In December 2019, emerging cases of a new strain of corona virus occurred in Wuhan, China, which spread across the globe within months. A few effects of COVID-19 have been overcrowded hospitals and intensive care units, a lack of hospital resources and nationwide lockdowns. Such factors have directly influenced the stroke treatment pathways established within primary care centres. **Materials and methods:** This study was conducted at Department of Emergency Medicine, Sri Siddartha Medical College and Research Centre, B.H Road, Agalkote, Tumkur, Karnataka, India, which is a tertiary-care, referral, teaching institute with a comprehensive stroke center and an efficient emergency department and critical care unit, in South India. This hospital receives patients from all socio-economic backgrounds, predominantly from central and southern districts of karnataka, India. Patients who present with stroke, are admitted to the emergency department. All patients are then evaluated by the on-call neurologist. Patients who are eligible for thrombolysis or mechanical thrombectomy are taken for the respective intervention and are then admitted to the intensive care unit (ICU) or the ward. Patients who do not fulfil eligibility criteria for emergent interventions are directly admitted to the ICU or ward, and managed by the neurology team. **Results:** The total number of patients admitted with stroke during the time period from March 2019 to May 2019, January 2020 to March 2020 and March 2020 to May 2020 were 41, 36 and 38 respectively. The total number of in-patient admissions and out-patient visits to the department of neurology, and the entire hospital are given in table 1. The demographic details of patients are given in Table 2. There were significantly lesser diabetic patients in the 2019 group (p value 0.03). Other characteristics were similar between the groups. **Conclusion:** The present study suggests that there may be a relative increase in the incidence of stroke in the community, as a result of the COVID-19 pandemic. The patients who presented with stroke during the lockdown period had a higher NIHSS score.

Key Words: COVID-19, NIHSS score, intensive care unit, stroke.

INTRODUCTION

The COVID-19 pandemic has influenced every aspect of healthcare and the general functioning of populations. In December 2019, emerging cases of a new strain of corona virus occurred in Wuhan, China, which spread across the globe within months. A few effects of COVID-19 have been overcrowded hospitals and intensive care units, a lack of hospital resources and nationwide lockdowns.[1] Such factors have directly influenced the stroke treatment pathways established within primary care centres. Initial reports have identified a decrease in stroke admission rates following the onset of the pandemic. It is unclear whether stroke incidence has decreased or whether populations elicit avoidance behaviours for fear of viral infection.[2]

The primary objective of this study was to determine the number of hospital admissions for stroke during the 2 months of lockdown and the two preceding months, along with 2 corresponding months (March to

May) in 2019, and to determine if there was any significant difference in the numbers between these time periods.[3,4,5]

The secondary objectives were to compare the time between onset of stroke and presentation to the hospital, type of strokes that presented to the hospital, severity of stroke, number of code activations, number of thrombolysis conducted and in hospital mortality between the same time periods.

MATERIALS AND METHODS

Study Setting: This study was conducted at Department of Emergency Medicine, Sri Siddartha Medical College and Research Centre, B.H Road, Agalkote, Tumkur, Karnataka, India, which is a tertiary-care, referral, teaching institute with a comprehensive stroke center and an efficient emergency department and critical care unit, in South India. This hospital receives patients from all socio-economic backgrounds, predominantly from central and southern districts of karnataka, India. Patients who present with stroke, are admitted to the emergency department. All patients are then evaluated by the on-call neurologist. Patients who are eligible for thrombolysis or mechanical thrombectomy are taken for the respective intervention and are then admitted to the intensive care unit (ICU) or the ward. Patients who do not fulfil eligibility criteria for emergent interventions are directly admitted to the ICU or ward, and managed by the neurology team.

Study Design: A retrospective observational study was conducted with patients presenting with stroke in three time periods, namely during the lockdown period (March 2020 to May 2020), a similar time period just prior to the lockdown (from January 2020 to March 2020) and the same time period in the previous year (March 2019 to May 2019). The results are reported in accordance with the STROBE guidelines.

Study participants: All patients admitted to the department of neurology with a diagnosis of stroke (ischemic stroke, haemorrhagic stroke and transient ischemic attack) during the study period were included in the study.

Study Variables: Patient information such as age, sex, time from onset of stroke to hospital admission, type of stroke, severity of stroke (NIHSS score), comorbidities, length of hospital stay and mortality were abstracted from the electronic medical records (EMR). Details of code activation and thrombolysis were also retrieved. Hospital statistics such as total number of in-patient and out-patient admissions in the department of neurology and the entire hospital were obtained from the medical records department.

Statistical Methods: Descriptive measures such as median, mean and standard deviation (SD) were calculated for all continuous variables, whereas percentages were calculated for all categorical variables. Comparison between the time periods were done using the z-test for proportions, student t test for means and Mann-Whitney test for medians. All the analyses were performed using Statistical Package for Social Sciences (SPSS) software, version 23.0.

RESULTS

The total number of patients admitted with stroke during the time period from March 2019 to May 2019, January 2020 to March 2020 and March 2020 to May 2020 were 41, 36 and 38 respectively. The total number of in-patient admissions and out-patient visits to the department of neurology, and the entire hospital are given in table 1. The demographic details of patients are given in Table 2. There were significantly lesser diabetic patients in the 2019 group (p value 0.03). Other characteristics were similar between the groups.

Table 1: Baseline Characteristics of Stroke In-Patients in Three Time Periods

Characteristics	Corresponding period in 2019	2020, Before Lockdown Period	2020, during Lockdown Period	P Value	
				Comparing Before and during Lockdown	Comparing Lockdown Period to Same Period in 2019
Number of strokes	41	36	38		
Stroke cases per neurology IP (%)	41/58 (70.7%)	36/67 (53.7%)	38/53 (70.8%)	0.185	0.99
Stroke cases per hospital IP (%)	41/2092	36/1878	38/1293	0.013	0.015
Neurology OP cases per hospital OP (%)	1444/2988 4 (4.8%)	1183/25465 (4.6%)	663/13573 (4.9%)	0.16	0.74
Time to hospitalization, mean hours	21.7 (+/- 26.5)	25.7 (+/-32.1)	35.9 (+/-61.6)	0.21	0.07

(SD)					
Time to hospitalization (median hrs)	10.2	11	11		
Ischemic strokes (%)	38 (93.9 %)	32 (88.9 %)	35 (92 %)	0.88	0.92
Haemorrhagic stroke (%)	1 (2.4 %)	1 (2.8 %)	1 (1.3 %)	0.54	2
Transient ischemic attacks (%)	2 (3.7 %)	3 (8.3 %)	2 (6.7 %)	0.72	0.42
Outcome					
Mean duration of hospitalization, days (SD)	6.5 (6.3)	5.4 (4.7)	6.6 (4.2)	0.13	0.92
Median duration of hospitalization (days)	5	5	5		
Mortality (%)	2 (4.9 %)	1 (2.8 %)	2 (4 %)	0.69	0.79

Table 2: Demographic Features of the Patients Admitted with Stroke during Three Time Periods

Characteristics	**Corresponding period in 2019**	**2020, Before Lockdown Period**	**2020, during Lockdown Period**	**P Value**	
				Comparing Before and during Lockdown	**Comparing Lockdown Period to Same Period in 2019**
Age, Mean (SD)	67.3 (+/-10.8)	67.5 (10.9)	66.9 (10.3)	0.77	0.86
Men (%)	22 (53.7 %)	24 (66.7 %	27 (72 %)	0.76	0.25
Diabetes (%)	17 (41.5 %)	27 (75 %)	27 (73.3 %)	0.93	0.03
Hypertension (%)	33 (80.5 %)	27 (76.4 %)	28 (74.7 %)	0.92	0.76
CVA/TIA (%)	2 (6.1)	2 (6.1)	4 (10.7)	0.46	0.33
Coronary artery disease (%)	8 (19.5%)	8 (23.6 %)	9 (24 %)	0.96	0.58

There were statistically significant differences between the strokes per neurology in-patients (IP) before and after lockdown, as well as strokes per hospital IP before and during lockdown. Although absolute number of out-patients (OP) had reduced to almost 50 %, there was no statistical difference in the proportion of neurology OP per hospital OP.

The mean time to hospitalization was higher during lockdown, but this difference was not statistically significant. This can be explained by skewed data as evidenced by the comparable median values.

DISCUSSION

We wanted to minimize the possibility that patients and the healthcare team cross infect each other. The treating team was split into smaller groups. This ensured that even if one team was exposed to a patient and had to be quarantined, the remaining teams could take over their function and continue patient care.[6] Furthermore, a telemedicine center was opened to facilitate online review of patients with chronic diseases. A junior doctor and clinical pharmacist collected all the relevant details from the patient and reviewed previous records. This information was sent to a consultant neurologist who would call the patient or caregiver over telephone or video call. If the neurologist felt that the patient had to come to the hospital for further evaluation or admission, they were asked to do so. If the patient needed a refill of medication, the prescription was sent to the pharmacy. The hospital arranged for home delivery of refill medications to the patient's home, within a 20 km radius of the hospital.[7]

Seating arrangements in areas such as the waiting area, near pharmacy counters and the laboratory were rearranged to ensure safe physical distancing. The use of a face mask by all patients and bystanders was made mandatory. OP timings were changed, such that OP waiting times would be reduced. The aim was to ensure that patients can return home early in view of the various travel restrictions. Patient discharges were planned in the morning hours so that the patient and caregivers could travel home in the morning, when travel restrictions were lighter. Contact details of the telemedicine centre and a liaison were given so that online review was possible.[8]

As the number of COVID-19 patients continue to increase worldwide, secondary effects of the pandemic are being identified. As more healthcare resources are being diverted to handle this crisis, there

are less resources to treat other conditions. Many countries have imposed travel restrictions both international and domestic, in an attempt to slow the spread of SARS–CoV-2.[9] There is concern that these measures may have unintended consequences such as hampering the patient's ability to seek healthcare. Neurological complications of COVID-19 have been described and one of the most common appears to be large vessel stroke. Moreover, cerebrovascular events are associated with severe disease and poor outcome in patients with COVID-19. Given this association between stroke and COVID-19, we sought to examine the impact the current pandemic and the various measures taken to contain it had on admissions for stroke in our hospital.[10]

CONCLUSION

The COVID-19 pandemic has resulted in significant disruption of healthcare services around the globe. The measures taken to slow the spread of COVID-19 may have also contributed to this. In our study, we did not observe a significant difference in the total number of patients with stroke who presented to our hospital before and after lockdown, when compared to the pre-COVID period.

However, there was an increase in the proportion of stroke cases, indicating that the incidence of stroke may have increased. This increase may have been masked by a reduction in the total number of patients presenting to the hospital.

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