Original Research Article

A comparative time matched hospital based study of first ever stroke patients admitted to stroke unit during pre-COVID 19 vs COVID 19 pandemic era

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A B S T R A C T

Aim & Objectives: To study effects of COVID 19 pandemic era on demographics, type and severity of strokes, morbidity & mortality among patients having first ever stroke who were admitted to stroke unit during similar months(April & May) in year 2019 & 2020. To study the effects of COVID 19 pandemic era on diagnosis of minor strokes and utilization of imaging modalities(MRI/NCCT).

Settings and Design: Retrospective Study.

Materials and Methods: The study was conducted at GMC Kota, a tertiary care hospital in Rajasthan. All patients having their first ever stroke and admitted to our stroke unit during the pre-COVID 19 period (April 2019-May 2019) and the COVID 19 period (April 2020-May 2020) were considered. The characteristics of stroke, the severity, the number of admissions per day, and demographic characteristics as well as the short-term outcomes were studied.

Statistical analysis used: Biostatistician was consulted for statistical analysis. Descriptive statistics, Shapiro-Wilk test, means with standard deviation, Chi-square test, Fisher's exact test, Linear and logistic regression were used as per data characteristics and requirement. P-value of <.05 was considered significant.

Results: Of the 108 patients included, 44 (40.7%) presented during the COVID-19 period. There was a 36% reduction in first-ever stroke diagnoses from (1.05/day) to (0.72/day) (p<.0001). The admitted patients were five years older and in much worse health than in the pre-COVID 19 era (p<.0001). There was a statistically significant reduction in MRI use by 27% (p=0.055).

Conclusions: The observation suggests an overall reduced number of stroke admissions per day. Patients admitted were older and more severely ill. In COVID 19 era patients, mortality and mRS at admission and discharge were higher, along with a longer hospital stay. An overall reduction in the utilization of MRI was observed due to COVID protocol.

1. Introduction

Since the first case in India which was diagnosed on January 30th 2020, more than eight and half million cases are currently COVID 19 positive in India.[1] The government planned and implemented reforms aimed at halting SARSCOV-2's spread looking at its rapid spread and severity. Thus, people are avoiding hospitals and seeking telemedicine consultations, which has caused the epidemiology to shift.[2] Previously patients took medical advice for mild stroke symptoms also, but now they avoid visiting hospitals. So, the reported stroke incidence rate has declined, but the ratio of patients with more severe illnesses has increased.[3] The literature suggests that SARS-CoV-2 infection may lead to wide range of neurological complications, which range from anosmia to stroke.[4] An observation shows a fall in the number of first-time stroke admissions, but that these admissions are more severe.

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Therefore, to gain an insight into it, we conducted a retrospective comparison of first ever stroke characteristics in pre-COVID 19 era and COVID 19 pandemic era at GMC, Kota, Rajasthan. In order to reduce biases caused by the environment and culture, similar months were taken into account. We hypothesized that the number of first ever strokes would drop, whereas the severity of strokes would be relatively greater in COVID-19 pandemic era compared to the pre-COVID-19 era.

2. Materials and Methods

This study has been approved by the institutional ethical committee. We evaluated a retrospectively collected cohort of stroke patients over the age of 18 years who were admitted to department of neurology GMC Kota's stroke unit, Rajasthan, from April 2019 through May 2019 and April 2020 through May 2020. In the presence of clinical suspicion, radiographic evidence on computed tomography (CT) or diffusion-weighted magnetic resonance imaging (DWI-MRI) was used to diagnose stroke. For all patients included, demographics, National Institutes of Health Stroke Scale (NIHSS) scores, and mRS at admission and discharge were collected. Strokes were categorized as ischemic, intraparenchymal hemorrhagic, subarachnoid hemorrhage, and cerebral venous thrombosis. For Statistical analysis biostatistician was consulted. Descriptive statistics, Shapiro-Wilk test, means with standard deviation, Chi-square test, Fisher's exact test, Linear and logistic regression were used as per data characteristics and requirement. P value of <.05 was considered significant.

3. Results

Patient admitted during pre-COVID era April 19 - May 19 (64 cases) and COVID 19 era April 20 - May 20 (44 cases) in 2 months. Of the 108 patients included in this study, the average age of presentation was approximately 60 years in pre-COVID 19 era & 65 years in COVID 19 era, the difference was statistically significant (p<.0001) and of which 64% & 50% are male in pre-COVID and COVID era respectively. In comparison with stroke patients admitted in pre COVID 19 era, those admitted during COVID 19 at our facility had no statistically significant differences with regard to sex, predominant circulation (anterior vs posterior), vascular risk factors, stroke types, NIHSS at admission, and mortality. There were statistically significant differences in the age of onset (p<.0001), daily stroke admissions (p<.0001), number of MRIs performed (p=.0055) & severity of stroke (mRS at admission & discharge) (p<.0001). (Table.1). However, thrombotic (60.1% vs 50%, p=.352) & embolic (15.6% vs 6.8%, p=.279) strokes were more common in the Precovid era. In contrast hemorrhagic (20.3% vs 34.1%, p=.167) and cerebral venous thrombosis (3.12% vs 6.18%, p=.667)

were more common during the COVID 19 era. The average admission per day has also been significantly reduced statistically (1.05 vs 0.72, P<.0001), falling by 36%. There was statistically significant difference between the average mRS of patients at admission (3.10 vs. 3.72, p<.0001) & at discharge (2.96 vs. 3.79, p<.0001). Although mortality was higher in COVID 19 era (10.94% vs 25%, p=.096), but the difference was not statistically significant.

4. Discussion

In a retrospective observational study at our center, we noticed a significant decline in the number of new daily acute stroke admissions to the stroke unit by 36% (p<.0001). The incidence of acute strokes was falling, but this seems unlikely. In this case, availability of caretaker and transportation services are likely to be factors related to decline.[5] Many people, especially those who suffer mild or transient stroke symptoms, are fearful they will get infected in hospitals during the pandemic. Baracchini et al[6] and Marcello Naccarato et al.[7] also stated a similar hypothesis. The other important factor that contributed to the lower stroke detection is the reduction in utilization of MRI during the COVID19 period. In our study we found a significant reduction in MRI use (approximately 27% reduction, p= .055). This may be due to new guidelines for the use of MRI, to limit staff exposure to infection.[8]

The risk of severe illness from COVID-19 increases with age, and older adults are at the highest risk. As found in our study as well, older individuals were more admitted during this pandemic era, when compared to the Precovid era, the mean age of presentation was approximately five years higher and statistically significant (p<.0001). Patients with a severe aphasia, vision loss, or dominant hand weakness have relatively low NIHSS[9] but have significant disability. Hence, NIHSS is a poor marker for assessing stroke severity, Neurological improvement & final infarct volume[10–12] as seen by J.E. Siegler et al[13] In our observation also, although the mean baseline NIHSS was higher, it did not correlate well with disease severity therefore the difference was not statistically significant (8.44 vs 8.98, p=.097) between the two periods. A number of studies have indicated that SARSCOV-2 can cause systemic inflammation as well as increased thrombotic events and coagulation abnormalities thereby increasing the chances of a severe stroke.[14] The high death rate appears to be an independent effect of COVID-19. In terms of stroke type, hemorrhagic was up from 20.3% to 34.1%, while cerebral venous thrombosis increased from 3.125% to 6.18%, which may indicate more severe cases of stroke reaching hospital. Compared to pre-COVID (18.75%), the percentage of posterior circulation stroke was higher by about 25%. Minor posterior circulation strokes cause more disability than minor anterior circulation strokes, requiring the patient to seek medical attention.[15] These observations are consistent

Table 1:

Characteristics	Pre COVID 19 era(n=64)	COVID 19 era(n=44)	p value
Age mean	60.15 ±3.46	65.31±3.27	p < 0.0001
Male	64.06%	50%	0.20
Hospital stay duration(avg.)	8.98 ±2.15	9.38 ±1.78	0.31
Imaging-MRI Brain	52(81.25%)	24(54.54%)	p=.0055
Circulation			
(1)Anterior	76.5%(49)	63.7%(28)	0.45
(2)Posterior	18.75%(12)	25%(11)	
Stroke Type-			
• Thrombotic	60.1%(39)	50%(22)	0.35
• Embolic	15.6%(10)	6.8%(3)	0.27
• Hemorrhagic	20.3%(13)	34.1%(15)	0.16
• CVT	3.12%(2)	6.18%(3)	0.66
Daily stroke admission	1.05	0.72	p < 0.0001
Hypertension	65%(42)	75%(33)	0.40
Diabetes mellitus	12.5%(8)	25%(11)	0.15
Dyslipidemia	34.3%(22)	27.7%(12)	0.56
Coronary artery disease	9%(6)	13%(7)	0.46
NIHSS at presentation	8.44 ±0.74	8.98 ±2.15	0.097
Outcome			
1)mRS at Admission	3.10 ±0.22	3.72 ±0.27	p < 0.0001
2)mRS at Discharge	2.96 ±0.32	3.79 ±0.44	p < 0.0001
3)Mortality	10.94%(7)	25%(11)	0.096

with statistically significant difference in mRS at admission (p<.0001) between two eras. In the COVID 19 era, male and female admissions were roughly equal, which suggests severity appears unrelated to gender. Comparatively to the pre-COVID era, when nearly 64% of patients were males and stroke victims were younger by five years, which may be explained by tobacco and alcohol addictions.[16] During the COVID 19 era, patients stayed in the hospital for approximately 2 days longer following strokes, which point towards the more severity.

Among patients admitted during the COVID 19 era, hypertension (65% vs 75%), diabetes (12.5% vs 25%), and coronary artery disease (9% vs 13%) were more prevalent, which may be responsible for causing severe disability and adverse outcome. This is suggested by higher mortality (25% vs 10.94%, p=.096) and poorer mRS at discharge which was statistically significant (p<.0001). In a study by M.E. Siegler JE et al[12] the effect of these risk factors were nearly similar in both groups. But, our findings are consistent with those of Marcello Naccarato et al.[11] Hence, studies including larger number of patients with a longer follow up will be required to get a better insight.

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6. Conflicts of Interest

There are no conflicts of interest.

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