



Original Article

# The effects of the coronavirus disease 2019 pandemic on neurospine surgery practice in the referral center hospital developing country

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## ABSTRACT

**Background:** The coronavirus disease 2019 (COVID-19) pandemic represents a once in a century challenge to human health care with over 4.5 million cases and over 300,000 deaths thus far. Surgical practice has been significantly impacted with all specialties writing guidelines for how to manage during this crisis. This study reported the effect of the COVID-19 pandemic on the neurosurgical practice, especially neurospine, in the outpatient visit, emergency department, and the surgical procedure.

**Methods:** This study is the comparative retrospective about neurospine practice in the outpatient visit, emergency department, and the surgical procedure among before and during COVID-19 pandemic. We recorded data from January to December 2019 (before COVID-19 pandemic) and compared with the same period in the 2020 (during a COVID-19 pandemic).

**Results:** A total of the outpatient visits, the average number per month was  $28 \pm 10.5$  visits per month before the pandemic. The average number outpatient visit per month during the pandemic was  $19 \pm 11.1$  visits per month, with the lowest in July 2020. The result of the average monthly neurospine surgical procedure before the pandemic was  $5 \pm 1.9$  operations per month. Compared during the pandemic, there was decreased in the neurospine surgical procedure with the average number was  $2 \pm 2.7$  operations per month. The decreased number significantly happens in the surgical procedure and emergency department patient ( $P < 0.05$ ), while in the outpatient visit, the decreased statistically not significantly ( $P > 0.05$ ).

**Conclusion:** The COVID-19 pandemic changed all scopes of medical practice and training. Considering the limitation in the available resources, the number of educational cases may decrease in subspecialized disciplines such as neurospine neurosurgery. The COVID-19 pandemic affects in the neurospine and neurosurgery treatment policy in the referral tertiary hospital.

**Keywords:** Coronavirus disease 2019, Developing country, Neurospine practice, Pandemic, Referral hospital

## INTRODUCTION

A new type of virus that attacks the respiratory tract began in Wuhan, China, in late 2019 has spread across the world since then. The virus has caused an outbreak of viral pneumonia. The causative virus has been temporarily named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and

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the relevant infected disease has been named as coronavirus disease 2019 (COVID-19) by the World Health Organization.<sup>[6]</sup> First, an outbreak of an unknown disease called pneumonia of unknown cause occurred in Wuhan, Hubei Province, China. The outbreak has spread substantially to infect 9720 people in China with 213 deaths and to infect 106 people in 19 other countries up to January 31, 2020.<sup>[1]</sup> The spectrum of clinical presentations of COVID-19 has been reported ranging from asymptomatic infection to severe respiratory failure. The main symptoms include a self-reported fever, fatigue, dry cough, myalgia, and dyspnea. The uncommon symptoms include sputum production, a headache, hemoptysis, and diarrhea. Indonesia as a one of the country that affected by this outbreak reported 1.8 million confirmed cases and 51,612 deaths till June 2021.<sup>[3]</sup> This situation makes the government establish a policy microscale social restrictions. The economy and health section became one of the most affected. Health facilities treat many COVID-19 patients and a lot of health workers must help to take care of COVID-19 patients, regardless of the specialty field.

Dr. Soetomo General Academic Hospital is a tertiary referral hospital and a COVID-19 referral center in Surabaya, East Java, Indonesia. A lot of COVID-19 cases from the East Java region referred to this hospital to be treated. The neurosurgery department serves the health field of neurotrauma, neurovascular, neuro-oncology, neuropediatric, neurofunctional, and neurospine surgery. Many countries reported decreased in hospital treatment and outpatient since the COVID-19 pandemic.<sup>[7]</sup> This decreased condition especially reported in the referral center hospital in many countries. This study aims to report the data of the COVID-19 pandemic on neurosurgical treatment, especially in neurospine surgery at the tertiary referral and COVID-19 referral center hospital. The result of this study is expected to be useful for the hospital and another association making a policy during this COVID-19 pandemic situation.

## MATERIALS AND METHODS

This study used a retrospective case control with analytical observational. The sample method used a total population of the neurospine division from neurosurgery department that came to the clinic, emergency department, and inpatient care at the time from January to December 2019 and January to December 2020.

Group's comparison was analyzed using the Kruskal–Wallis nonparametric comparative test. Statistical analysis was performed using the IBM SPSS Statistics for Mac version 26. The difference in the group of outpatient visit, emergency department visit, and surgery procedure was statistically calculated and considered significant if  $P < 0.05$ . This method was to compare the number of neurospine division patient before and after COVID-19 pandemic.

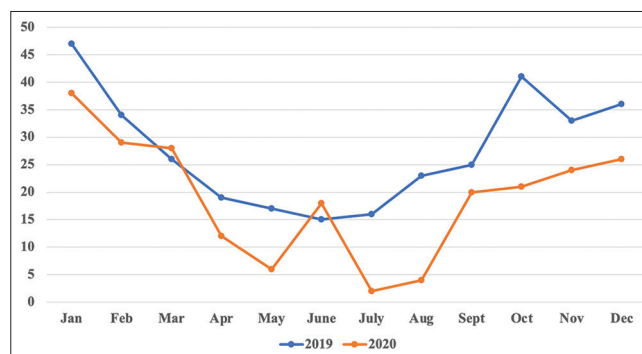
## RESULTS

We collected the data from our hospital, Dr. Soetomo General Academic Hospital, as a tertiary referral hospital in Surabaya, East Java, Indonesia. The data were analyzed from the clinic, emergency department, and surgery of neurospine cases. This study compared the data from before pandemic COVID-19 (January–December 2019) and during pandemic COVID-19 (January–December 2020) in Indonesia. The result from before the pandemic showed the number patient in the outpatient visited, the average number per month was  $28 \pm 10.5$  visits per month, with the lowest outpatient visit in June 2019 with 15 visits. The average number outpatient visit per month during the pandemic was  $19 \pm 11.1$  visits per month, with the lowest in July 2020. The number of monthly neurospine outpatient visit is shown in [Figure 1].

During the pandemic period from January to December 2020, there was a decrease number of neurospine outpatient visit compared to the same period before pandemic in 2019, except in the June where the number of neurospine outpatient visit more than in the same month in the 2019 or before the pandemic. The comparable number of monthly neurospine outpatient visit before the pandemic and during the pandemic in the same period is shown in [Table 1].

The number of the surgical procedure for the neurospine patient also decreased during the pandemic period in 2020 compared to the same period before the pandemic in 2019. The result of the average monthly neurospine surgical procedure before the pandemic was  $5 \pm 1.9$  operations per month. Compared during the pandemic, there was decreased in the neurospine surgical procedure with the average number was  $2 \pm 2.7$  operations per month. There was no neurospine surgical procedure in the May, June, July, October, November, and December during the pandemic period. The number of the monthly neurospine surgical procedure before and during the pandemic is shown in [Table 2]. This comparison is shown in [Figure 2].

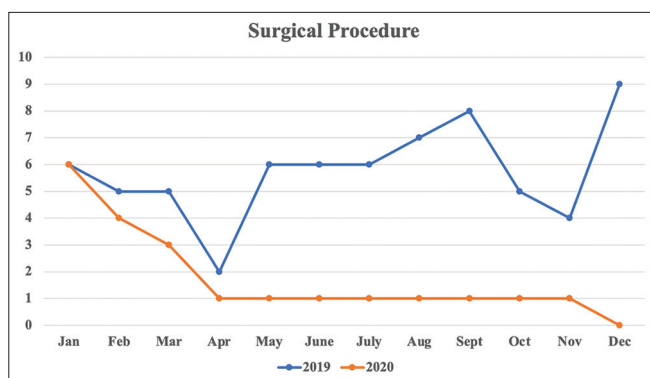
The decreased number also found in the emergency department visit of the neurospine patients during the



**Figure 1:** The comparable number of neurospine outpatient visit before and during the COVID-19 pandemic.

pandemic period. Based on the data, [Table 3] shown that monthly visit of the neurospine patients before pandemic period was  $1 \pm 1.1$  patient per month and there was no patient in the January, September, October, November, and December. During pandemic period, only one patient in the January 2020 and no patient in rest of the month. This comparison is shown in [Figure 3].

Based on the result of the nonparametric Kruskal–Wallis comparative test for the number of neurospine outpatient visit during January–December in the pandemic period and before pandemic in the same month is not significant ( $P > 0.05$ ) differences in the number of neurospine outpatient visit. The comparable number of the surgical procedure before and during the pandemic is significantly different ( $P < 0.05$ ), which is higher neurospine surgical procedure before



**Figure 2:** The comparable number of neurospine surgery treatment before and during the COVID-19 pandemic.

pandemic. The number of neurospine emergency patient significantly difference ( $P < 0.05$ ) in the number between before pandemic and during the pandemic. Neurospine emergency patient decreased in the number during the pandemic compared to the before pandemic.

## DISCUSSION

This study showed the decreased number of the neurospine outpatient visit during COVID-19 pandemic in the 2020 compared to the same period before COVID-19 pandemic in 2019. There was decreased in the number, but statistically no significant difference ( $P > 0.05$ ). In June 2020, the number of neurospine outpatient visit is higher than before the pandemic. In the first 3 months, January–March 2020, the number of patients is still same as before pandemic. Because in our country, the increased cases of COVID-19 start in April 2020. There was no policy about public mobility restriction and hospital regulation about pandemic situation in the first 3 months during the pandemic. The decreased neurospine patient visit decreased in the rest of the month, which the lowest outpatient visit in July 2020. This month is the highest case of COVID-19, there was accumulation of COVID-19 cases in the hospital. All the resources were used to treat COVID-19 patients and there was a restriction policy in the outpatient visit.

Based on the statistical data, the number of neurospine surgical procedure and emergency department significantly decreased ( $P < 0.05$ ) during the pandemic compare to the before the pandemic. In the first 3 months, the number of

**Table 1:** The number of neurospine outpatient visit.

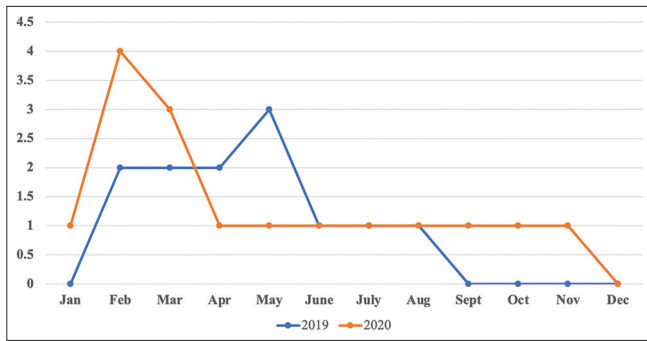
Year	Month												P-value
	January	February	March	April	May	June	July	August	September	October	November	December	
2019	47	34	26	19	17	15	16	23	25	41	33	36	0.062
2020	38	29	28	12	6	18	2	4	20	21	24	26	

**Table 2:** The number of neurospine surgery treatment.

Year	Month												P-value
	January	February	March	April	May	June	July	August	September	October	November	December	
2019	6	5	5	2	6	6	6	7	8	5	4	9	0.001
2020	9	4	3	1	0	0	0	1	2	0	0	0	

**Table 3:** The number of neurospine patient in the emergency department.

Year	Month												P-value
	January	February	March	April	May	June	July	August	September	October	November	December	
2019	0	2	2	2	3	1	1	1	0	0	0	0	0.008
2020	1	0	0	0	0	0	0	0	0	0	0	0	



**Figure 3:** The comparable number of neurospine patient in the emergency department before and during the COVID-19 pandemic.

the neurospine surgical procedure is still same as before the pandemic. The rest of the month decreased significantly compared to before the pandemic. There was no neurospine surgical procedure in the May, June, July, October, November, and December. Some of the COVID-19 problem is human resources and ICU room usage. The ICU room usage decreased because used for COVID-19 patient and the medical personnel help treating COVID-19 patients. Some of the elective surgery was canceled and only emergency or urgent surgery performed. The number of emergency patient significantly decreased during the pandemic, even though before the pandemic, the neurospine emergency department visit is low. During the pandemic, there was only one patient in the January 2020 and there was no patient in the rest of the month. This decreased number can be caused by restriction policy of mobility and almost all the cases in the emergency department were COVID-19 cases. As one of the tertiary referral hospitals, almost all of the cases were referred to the Surabaya, include COVID-19. When our hospital unable to accept another case, all the cases from another hospital, especially neurospine, were delayed to refer.

In the 2<sup>nd</sup> week of June 2020, the Indonesia had performed a polymerase chain reaction swab test for COVID-19 on 514,287 specimens from 322,933 people. There were 38,277 confirmed cases of COVID-19, with 2134 cases of death. The death rate was eight people per 1 million populations. The new cases increased from 300 cases per day on average in April and May to 500 cases per day in June 2020. East Java Province was the region with the highest COVID-19 cases in Indonesia, and the cases were distributed unevenly in 38 cities and towns.<sup>[10]</sup> The first confirmed cases of COVID-19 in East Java were obtained from March 2020. Based on the data, the number of confirmed cases in East Java was 5001 of cumulative active cases compared to the Jakarta that had 4334 cumulative active cases. The total number in East Java was 7780 cumulative confirmed cases, 2254 recovered cases, and 617 deaths.<sup>[10]</sup> The distribution of the patient's age from the confirmed cases was 40–49 years old (23%), 50–59 years old (21%), and above 60 years old (20%). Diabetes mellitus

and hypertension were the most common comorbidities in patients with COVID-19 infection. The daily average of new cases increased from <50 cases in April 2020 to 150 cases by June 2020. A rapid growth of the infection made the East Java provincial government to apply a large-scale social restriction regulation that was approved by the Indonesia Ministry of Health. This regulation then ended with June 2020 and was not continued. Surabaya had the highest number of confirmed cases among the cities and towns in East Java Province. Based on the data recorded 4014 cumulative active cases with 1269 recovered and 317 death cases.<sup>[10]</sup>

Meybodi *et al.*<sup>[8]</sup> reported that with the outbreak of COVID-19 in the Iran, the pattern and rate of surgeries in their tertiary center were substantially changed. During the 1<sup>st</sup> month of the outbreak, there were overwhelmed with a great number of urgent/emergency cases of brain tumors and acute hydrocephalus which were referred from other centers in the country. Jean *et al.*<sup>[5]</sup> reported in their journal that nearly half of the respondents in their study for around the world (46.1%) reported that their operative volume has dropped more than 50% during the pandemic. Even more neurosurgeons (61.4%) opined that all elective cases should be postponed. Whereas there are many reasons to justify this postponement, the most important one, and the only one cited in the American College of Surgeons' monumental recommendation, is on a societal level: to preserve essential supplies, such as ventilators, for the avalanche of patients who will overwhelm resources in the predictable future.

There are two important things to be held in our practice, as others: (1) urgent or emergent cases should be managed anyway and (2) maximum protection of patients and staff is of great importance. Decision-making about testing asymptomatic patients should be customized based on many factors related to the patients, society, medical centers, and the type of surgery. In our country with restricted resources, testing all the patients may not be cost effective; therefore, performing the diagnostic test for the symptomatic patients and with the high risk is the standard.<sup>[2]</sup>

Postponing elective surgeries are not only a reasonable strategy and it seems to be the only rational path for neurosurgeons until the end of the pandemic. The data from our US respondents indicated that even within the short 2 weeks of the principal study, the date of the response was a positive predictor of both the hospitals' response and neurosurgeons' opinion toward more stringent shutdowns.<sup>[4]</sup> Another factor that has a role in the decrease in the number of outpatients and neurosurgical visits is the recommendation of the Indonesian Society of Neurosurgery in response to large-scale social restrictions by the government.<sup>[9]</sup> This association recommended postponing visits to neurosurgery or hospitals unless there are emergency conditions such as trauma, postoperative control patients, and emergency



condition of neurosurgery cases. This research can be used as primary data and research as the references for the COVID-19 patient, especially in low- and/or middle-income country academic tertiary referral hospital.

## CONCLUSION

The number of neurospine patient in the clinic, emergency department, and surgical operation procedure decreased during the pandemic compared to the before pandemic in the same period. The COVID-19 pandemic changed all scopes of medical practice and training. Considering the limitation in the available resources, the number of educational cases may decrease in subspecialized disciplines such as neurospine neurosurgery. The COVID-19 pandemic affects in the neurospine and neurosurgery treatment policy in the referral tertiary hospital.

## Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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