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The effect of COVID-19 pandemic on stroke admissions to a city

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ABSTRACT

Aims: The COVID-19 pandemic has brought about significant changes in healthcare around the world. The idea that hospital admissions due to cerebrovascular diseases may be affected during global epidemics made us do this study. In this study, we aimed to evaluate the effects of the pandemic and curfew restrictions on stroke applications and admissions in Bursa at the local level.

Methods: Our study was conducted by retrospectively scanning the patients who received treatment for cerebrovascular diseases in our hospital between 01.01.2018 and 31.12.2021. The admission dates, ages and International Classification of Diseases (ICD-10) codes of the patients included in the study were recorded. ICD-10 codes were categorized as bleeding (I60/I61/I62), infarct (I63), nonspecific (I64/I67), other (I65/I66/I68/I69) for use in analyses. Patients under the age of 18 and patients with missing file data were excluded from the study. The files of a total of 6997 patients were accessed.

Results: When in this study look at the number of patients by years, it was seen that there were 1326 people in 2018, 1562 people in 2019, 1916 people in 2020, and 2187 people in 2021. It is noteworthy that if we call the years 2018-2019, when there is no COVID-19 pandemic, as prepandemic, and if we call the years 2020-2021, when the COVID-19 pandemic is experienced, as pandemic, the cases due to infarction (I63) increase approximately twice. In the chi-square analysis we performed between categorical diagnoses and years, a statistical difference was found between years and diagnoses ($p<0.001$)

Conclusion: We have raised awareness about improving stroke treatment and the importance of early diagnosis and treatment. Because stroke and its complications affect human life badly. Knowing the increase and decrease of acute stroke in pandemic and non-pandemic periods, we would shed light on the pandemics we will experience in the future.

Keywords: Acute stroke, COVID-19 pandemic, quarantine

INTRODUCTION

The COVID-19 outbreak began at the end of 2019, with the first case in Wuhan.[1] After it was declared as a global epidemic, many measures, including curfews, were introduced by governments in order to reduce the spread of the virus and prevent possible diseases and deaths.[2]

Studies have revealed that there has been a shift from infectious causes to vascular causes, in which non-communicable diseases such as stroke have replaced deaths from communicable diseases and nutritional causes.[2] This effect is probably due to the increase and aging of the world population, as well as the declining mortality rates worldwide in recent years.[3] The most prominent causes of death are vascular, and stroke is now the second leading cause of death worldwide.[4] Ischemic heart disease and stroke together caused 15.2 million deaths (15-15.6 million) in 2015.[4] While ischemic strokes account for the highest number of strokes, most of the global stroke burden, measured in proportion to mortality and mortality and disability-adjusted life years (DALYs), is from hemorrhagic stroke.[5]

The COVID-19 pandemic has brought about significant changes in healthcare around the world. The driving force for this study was the thought that hospital admissions due to cerebrovascular diseases may be affected in global epidemics. In this study, we aimed to evaluate the effects of the pandemic and curfew restrictions on stroke applications and admissions in Bursa at the local level.

METHODS

The study was carried out with the permission of Bursa City Hospital Ethics Committee (Date: 04/01/2023, Decision No: KAEK 2023-1/4). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

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Statistical Analysis

The findings of the study are evaluated using 'The Jamovi project (2021), Jamovi (Version 2.0.0) [Computer Software]. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used while evaluating the study data. The Mann-Whitney U test was used for comparisons between two groups of quantitative variables without normal distribution. Pearson chi-square test and Fisher Exact test were used to compare qualitative data. One-way Anova test and Kruskal-Wallis test were used to investigate whether there was a significant difference between more than two independent groups according to the arithmetic mean. Post-hoc Tukey and Tamhane tests were used to investigate which groups caused the significant difference between the groups. Pearson test was used for parametric variables and Spearman test was used for nonparametric variables during correlation analysis. Linear regression was used to estimate the variation in hospital admissions for stroke in our hospital. Statistically, $p<0.05$ was considered significant at the 95% confidence interval.

RESULTS

This stud have shown the total number of emergency admissions, the total number of applications due to stroke, and the incidence of stroke among all admissions during the years 2018 and 2021 included in our study (Table 1).

Table 1. 2018-2021 Incidence of stroke

Years	Stroke referral	Total emergency referral	Stroke rate(%)
2018	1326	4.038.754	3.2
2019	1562	4.517.149	3.4
2020	1916	3.571.055	5.3
2021	2187	4.557.953	4.8

A total of 6991 patients were included in the study. The mean age of the patients was calculated as 69 ±15.8. When we look at the number of patients by years, it was seen that there were 1326 people in 2018, 1562 people in 2019, 1916 people in 2020, and 2187 people in 2021. It is noteworthy that between 2018 and 2019, when there was no COVID-19 pandemic, and between 2020 and 2021, when the COVID-19 pandemic was experienced, the cases caused by infarction (I63) increased by approximately 2 times (Figure 1). When this study look at the categorical diagnostic distributions of all cases included in the study, patients with intracranial bleeding (I60/I61/I61) were 15%, intracranial infarction (I63) cases were 17.9%, bleeding or infarct was not differentiated (I64, I67) 44.9% and other (I65, I66, I68, I69) constitute 22.2% of the cases. In the chi-square analysis we performed between categorical diagnoses and years, a statistical difference was found between years and diagnoses ($p<0.001$) (Table 2). In the Linear regression analysis between the cases by years, there was no statistical difference between 2018 and 2019 ($p=0.507$), while a statistical difference was found between 2018 and 2020 and 2021 in terms of the number of cases ($p<0.001$, $p<0.001$) (Table 3).

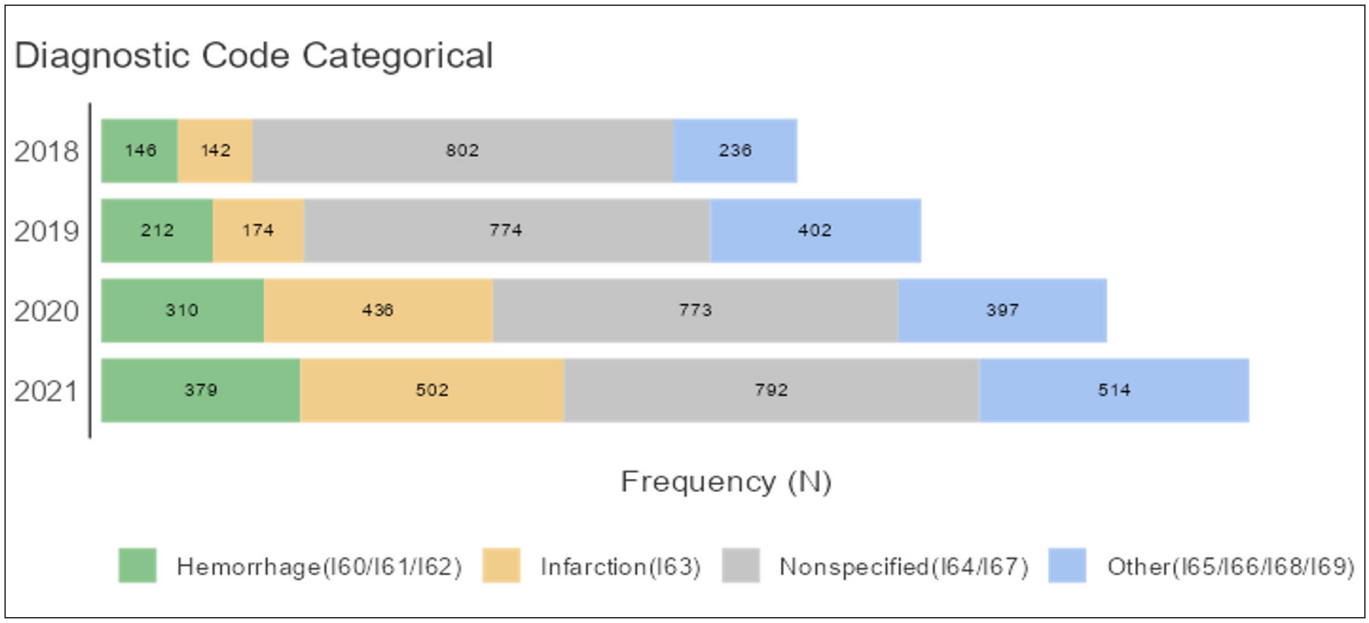

Figure 1. Distribution of categorical diagnoses by years

Table 2. Chi-square analysis of categorical diagnoses by years os stroke

Date	Diagnostic Code Categorical				Total	χ^2=309, p<0.001
	Hemorrhage (I60/I61/I62)	Infarction (I63)	Nonspecified (I64/I67)	Other (I65/I66/I68/I69)		
2018						
Observed	146	142	802	236	1326	
Expected	199	238	596	294	1326	
% within row	11.0 %	10.7 %	60.5 %	17.8 %	100.0 %	
2019						
Observed	212	174	774	402	1562	
Expected	234	280	702	346	1562	
% within row	13.6 %	11.1 %	49.6 %	25.7 %	100.0 %	
2020						
Observed	310	436	773	397	1916	
Expected	287	344	861	425	1916	
% within row	16.2 %	22.8 %	40.3 %	20.7 %	100.0 %	
2021						
Observed	379	502	792	514	2187	
Expected	328	392	983	485	2187	
% within row	17.3 %	23.0 %	36.2 %	23.5 %	100.0 %	
Total						
Observed	1047	1254	3141	1549	6991	
Expected	1047	1254	3141	1549	6991	
% within row	15.0 %	17.9 %	44.9 %	22.2 %	100.0 %	

Table 3. Estimation of linear regression of hospital admissions by stroke subtypes between 2018 and 2021

Predictor	Estimate	SE	t	p
Intercept[a]	28.507	0.0264	107.992	< .001
Date				
2019 - 2018	0.0238	0.0359	0.664	0.507
2020 - 2018	-0.1946	0.0343	-5.668	< .001
2021 - 2018	-0.1918	0.0335	-5.733	< .001

DISCUSSION

In a study published in 2019, the number of strokes over the age of 20 was reported to be 7 million annually and its prevalence was 2.5%.[6] In a study, the rate of stroke among all emergency admissions made during a 2-year period was reported to be less than 1%.[7] In our study, among all emergency applications, it was observed that acute stroke cases were between 3.2-3.4% before the pandemic, and increased by 4.8-5.3% in the last two years with the pandemic. Our stroke application rate, which is above the literature, may be due to the difference in genetic and environmental factors. We think that this finding, which is a very important stimulus for our country, should primarily be examined in new research and new health policies, as the prevalence of stroke patients in the world.

In this study examining acute stroke applications from several countries on 54366 people, it was reported that acute stroke applications decreased after the declaration of the pandemic compared to the pre-pandemic.[8] In a study known from the USA on 3556 patients, findings were reported that acute stroke admissions decreased but mortality increased with the COVID-19 outbreak.[9] In a study conducted with a narrow population of 328 patients, it was observed that despite the decrease in mild acute stroke admissions by 38%, there was an increase in cases of severe acute stroke by 21%, and there was no difference between pre-pandemic and post-pandemic stroke diagnoses.[10] In a population of 89 patients in China, it has been reported that acute stroke cases have a 1 hour delay in reaching the hospital compared to the pre-pandemic period, and the number of acute stroke cases has decreased compared to the pre-pandemic.[11] In a study examining the effect of the COVID-19 epidemic on acute strokes in Southern Europe, it was reported that the application time was 30 minutes delayed compared to the pre-pandemic period, and the rate of admission for acute stroke decreased by 25% compared to the pre-pandemic period.[12] In a study conducted in Southern Brazil, it was reported that there was a significant decrease in mild acute stroke admissions before the pandemic, but there was no significant change in the number of patients presenting with intraparenchymal and subarachnoid hemorrhage in severe acute stroke cases.[13] It has been reported in a study that no significant difference was observed between the pre-pandemic and acute stroke applications in the first 3 months of 2020 with the pandemic, but a significant decrease was observed in acute stroke applications between the period after 2020 and the pre-pandemic period.[14] In a study conducted with the participation of 18 centers from 7 countries in South America, although a decrease was observed in acute stroke applications compared to the pre-pandemic period, when the countries participating in the study

were examined, an increase in acute stroke cases after the pandemic was similar to our study in a sociodemographic and socioeconomic country like Mexico, similar to Turkey seen.[15] In many studies reported from around the world, researchers attributed the decrease in acute stroke applications compared to the pre-pandemic period in the study results to the curfews due to COVID-19, and to the perception that if they apply to the hospital, they may encounter COVID-19 microorganism more likely in the hospital due to inpatients due to COVID-19. In our study, contrary to the literature, the increase in acute stroke cases compared to the pre-pandemic; It can be attributed to the higher rate of use of hospital emergency services compared to other countries, the perception of people to get rid of isolation by applying to the hospital due to the release of the curfew in the pandemic on the condition of going to the hospital, and the fact that Turkish people do not think that the risk of transmission will increase in the hospital as a result of the fatalistic understanding. We find it natural that the picture revealed by COVID-19 causes coagulation disorders and vascular problems occur, and the increase in acute ischemic stroke cases with the decrease in mobility during the isolation period.

Study Limitations

Limitations of this study are the inability to enter the subtypes because the diagnosis of stroke/TIA/ICH in hospitals was obtained using hospital ICD codes. Centers contributing to this data have hospital information systems to track stroke admissions; therefore, the data from this analysis are correct. Details on patient-level data, including demographic information, stroke subtypes, and clinical outcomes, were not collected because they were not the focus of the study. As in all other studies, the frequency of stroke may have been low due to our data, the frequency of admission at each center and during the study period, and the individual fear of the epidemic. The definition of the pandemic period may differ from country to country, as the epidemic begins and peaks at different times in different places.

CONCLUSION

Stroke will continue to be the reason for hospital admissions, increasing its importance in the future with the prolonged life expectancy and aging world population. We think that it is important to examine stroke, which is a vascular cause of death, during pandemic periods in our world where there is always the suspicion of encountering a pandemic again. With the right health policies, early applications of stroke to health institutions can be triggered and encouraged, even under the pressure of the pandemic. As in every disease, early admission to the health center will prevent many complications, including morbidity, mortality and prolongation of the rehabilitation process.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Bursa City Hospital Ethics Committee (Date: 04/01/2023, Decision No: KAEK 2023-1/4).

Informed consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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