DOI: 10.14744/cm.2023.02486
Comprehensive Medicine 2023;15(2):132-137

RESEARCH ARTICLE

The Effect of the Full Closure Process on the Patient Density in the Emergency Department

Gökhan Yılmaz[1], Ahmet Uyanık[1], İsmail Aktaş[1], Murat Akıncı[1], Hasan Gazi Uyar[2]

[1]Department of Emergency Medicine, Konya Meram Public Hospital, Konya, Türkiye
[2]Department of Emergency Medicine, Konya Yunak Public Hospital, Konya, Türkiye

ABSTRACT

Objective: Social isolation methods are one of the important steps in the prevention of viral pandemics. In this study, we aimed to determine the impression of the full closure process, which is one of the social isolation methods, on the emergency department patient density and the operation of the emergency department.

Materials and Methods: Patients who admitted to Konya Meram Public Hospital between April 14, 2021, and June 01, 2021, with coronavirus disease 2019 symptoms and signs were included in the study. Three periods were established for the study: The pre-full closure period, the full closure period, and the post-full closure period. The number of daily admissions to the emergency department, the number of patients hospitalized from the emergency department to the pandemic service or the pandemic intensive care unit, and the total number of hospitalizations were recorded for these three periods.

Results: The information data of 7891 patients who come into the emergency department between the specified dates were included in the study. The difference between all patient groups was found to be statistically significant as a result of the statistical analyzes made with the number of daily admissions to the emergency department, the number of patients hospitalized from the emergency department to the pandemic service or the pandemic intensive care unit, and the total number of hospitalizations (p=0.001).

Conclusion: We concluded that the full closure process contributes to the reduction of emergency department patient density in viral pandemics. We think that social isolation should be considered in order not to disrupt the functioning of the hospital, especially in the emergency departments, in viral pandemics that may be seen in the future.

Keywords: COVID-19, emergency department, full closure, patient density

How to cite this article: Yılmaz G, Uyanık A, Aktaş İ, Akıncı M, Uyar HG. The Effect of the Full Closure Process on the Patient Density in the Emergency Department. CM 2023;15(2):132-137

INTRODUCTION

After the coronavirus disease 2019 (COVID-19) was accepted as a pandemic by the World Health Organization, countries took preventive measures due to the lack of effective treatment and the high contagiousness. In many countries, steps have been taken regarding social isolation and regulations regarding masks and hygiene conditions to protect against COVID-19 contamination.[1] In our country, a scientific committee has been established for COVID-19, it is aimed to establish a standard prevention and treatment protocol in the war to the COVID-19 pandemic.[2] In written and visual media, steps have been taken to raise public awareness about the disease and its precautions for masks, hygiene, and isolation, such as "14 rules to be followed against the Novel Coronavirus disease.[3]" The fact that the virus mutates frequently and an effective treatment method for new variants cannot be found in the early period have forced countries to take a partial or full closure decision to prevent the rapid spread of disease.[3] As in many European countries, as a result of the vertical rise in the number of cases, full closure was implemented in Türkiye, starting from 19:00 on Thursday, April 29, 2021, and continuing until 05:00 in the morning on Monday, May 17, 2021.[4]

Address for Correspondence: Gökhan Yılmaz, Department of Emergency Medicine, Konya Meram Public Hospital, Konya, Türkiye
E-mail: gokhanyilmaz36@yahoo.com.tr **ORCID ID:** 0000-0002-7621-553X

Received date: 14.02.2023
Revised date: 17.02.2023
Accepted date: 20.02.2023
Online date: 20.03.2023

With the COVID-19 pandemic, hospitalizations in service and intensive care units, especially emergency department applications, have increased. This has increased hospital bed occupancy rates and an excessive burden on the health system.[5] The increase in the number of patients come into the emergency department has led to a prolonged waiting time for the emergency department.[5] Although a significant decrease was seen in the number of cases and death rates with the full closure process, the effect of the full closure process on the intensity of the emergency department has not been adequately investigated.

The study aims to determine the effect of the full closure process on patient density in a pandemic hospital emergency department.

MATERIALS and METHODS

Study Design and Method

This study was done in the emergency department of Konya Meram Public Hospital, a pandemic hospital in Konya province in Türkiye. The study was conducted retrospectively with patients who presented with clinical symptoms and signs of COVID-19 between April 14, 2021, and June 01, 2021. Ethics committee approval was obtained from KTO Karatay University Non-Pharmaceutical and Medical Device Research Ethics Committee (Date and number: 01/03/2022-28170 and decision number: 2022/031) before the study. Study data were collected between April 15, 2022, and May 15, 2022. The study was carried out by the Helsinki Declaration.

Three periods were identified in this study: the pre-full closure period, the full closure period, and the post-full closure period. The pre-full closure period was from April 14, 2021, to April 28, 2021, the full closure period was from April 29, 2021, to May 17, 2021; and the post-full closure period was from May 18, 2021, to June 1, 2021.

Sample Selection and Patient Population

All male and female patients who admitted to the emergency department of our hospital with the symptoms or signs of COVID-19 within the specified date ranges were included to the study. Patients with the international diagnosis code (ICD) Z03.9 (Observation for suspected disease or condition, undefined) and U07.3 (COVID-19) were selected from the hospital registry system. Patients with positive COVID-19 polymerase chain reaction (PCR) tests among the patients determined according to ICD codes were included in the study.

Patients with missing data in the hospital registry system, pregnant women and patients under 18, patients with negative PCR tests, and patients who applied for reasons other than COVID-19 symptoms or signs were excluded from the study. These patients were not included because another hospital in Konya was designated as a pandemic hospital for gynecology and pediatric patients. Another hospital was determined for patients who applied for reasons other than Covid-19 symptoms or signs. Since only COVID-19 patients were treated and followed up in our hospital, these patients were directed to the other designated hospital. Therefore, these patients were excluded from the study.

Data Collection

We determined our study for the three periods, the number of daily admissions to the emergency department and the number of patients hospitalized from the emergency department to the pandemic service or the pandemic intensive care unit were retrospectively scanned from the hospital registry system, and the data were recorded in the data collection form. Statistical analyses of the data were made using the SPSS program.

Statistical Analysis

Statistical analyses were calculated using SPSS 19.0 for Windows (IBM SPSS Statistics®, New York, USA). Descriptive criteria, mean and standard deviation, median, and IQR values are presented as percentage distributions. The data conformity to the normal distribution was checked with the Kolmogorov–Smirnov test. Kruskal–Wallis analysis was used because the normal distribution condition was not met to compare the number of patients pre-full closure, full closure period, and post-full closure. Mann–Whitney U-test was used for the pairwise analysis of the groups. The significance level was taken as $p<0.05$.

RESULTS

The information data of 7891 patients who admitted to the emergency department between April 14, 2021, and June 1, 2021, were included in the study. The numerical data of emergency admission, admission to the pandemic service and intensive care unit, and total hospitalization according to the study periods are given in Table 1.

As a result of the statistical analysis, it was seen that the daily patient medians were highest in the pre-full closure period, decreased during the full closure period, and were at the lowest level in the post-full closure period in all patient groups. The difference between the groups was statistically significant in all patient groups (p=0.001) (Table 2).

When the pre-full closure period and the full closure period are compared, the medians of the number of pa-

Table 1. Numerical analysis of the patients included in the study in the pre-full closure period, the full closure period, and the post-full closure period

	n	%
Patients admitted to the emergency department		
Pre-full closure period	4557	57.7
Full closure period	2248	28.5
Post-full closure period	1086	13.8
Total	7891	100
Patients hospitalized to the pandemic service from the emergency department		
Pre-full closure period	444	58
Full closure period	251	32.8
Post-full closure period	70	9.2
Total	765	100
Patients hospitalized to ıntensive care from the emergency department		
Pre-full closure period	86	48.3
Full closure period	64	36
Post-full closure period	28	15.7
Total	178	100
Patients hospitalized to the both pandemic service and ıntensive care unit from emergency department		
Pre-full closure period	540	56.7
Full closure period	315	33
Post-full closure period	98	10.3
Total	953	100

tients come into the emergency department, the number of patients hospitalized to the pandemic service from the emergency department, and the number of patients hospitalized to the both pandemic service and intensive care unit from the emergency department were calculated to be statistically significantly higher in the pre-full closure period than in the full closure period (p=0.001). There was no statistically significant difference between the median number of patients hospitalized to the intensive care unit from the emergency department between these two periods (p=0.077) (Table 3).

When the pre-full closure period and the post-full closure period are compared, the medians of the number of patients come into the emergency department, the number of patients hospitalized to the pandemic service from the emergency department, the number of patients hospitalized to the intensive care unit from the emergency department, and the number of patients hospitalized to the both intensive care unit and pandemic service from the emergency department were found to be statistically significantly higher in the pre-full closure period compared to the post-full closure period (p=0.001) (Table 3).

When the full closure period and the post-full closure period are compared, the medians of the number of patients admitted to the emergency department (p=0.001), the number of patients hospitalized to the pandemic service from the emergency department (p=0.001), the number of patients hospitalized to the intensive care unit from the emergency department (p=0.017), and the number of patients hospitalized to the both pandemic service and intensive care unit from the emergency department (p=0.001) were statistically significantly higher in the full closure period than in the post-full closure period (Table 3).

DISCUSSION

The change in the patient profile in the emergency departments due to the COVID-19 pandemic has led to new structuring of emergency department in hospitals.[6,7] Dirty and clean areas have been created in the emergency departments. The patient density has increased over time in the dirty area. Therefore, the patient burden in emergency departments has increased in favor of pandemic patients.[7] The increased patient density in emergency departments caused increased hospitalization rates in the pandemic services and

Table 2. Comparison of the number of patients admitted to the emergency department, hospitalized to the pandemic service from the emergency department, hospitalized to the intensive care unit from the emergency department, and hospitalized to the both pandemic service and intensive care unit from the emergency department, according to the study periods

	Mean	SD[b]	Median	IQR[c]	p
Patients admitted to the emergency department					
Pre-full closure period (Daily)	303.80	87.38	300	159	0.001[a]
Full closure period (Daily)	118.32	36.33	113	61	
Post-full closure period (Daily)	72.40	19.64	66	27	
Patients hospitalized to the pandemic service from the emergency department					
Pre-full closure period (Daily)	29.60	8.25	29	12	0.001[a]
Full closure period (Daily)	13.21	8.19	10	11	
Post-full closure period (Daily)	4.67	2.25	5	3	
Patients hospitalized to ıntensive care from the emergency department					
Pre-full closure period (Daily)	5.73	3.80	5	5	0.001[a]
Full closure period (Daily)	3.37	1.89	3	3	
Post-full closure period (Daily)	1.87	1.55	2	1	
Patients hospitalized to the both pandemic service and ıntensive care unit from emergency department					
Pre-full closure period (Daily)	36.00	10.98	37	15	0.001[a]
Full closure period (Daily)	16.58	8.79	16	15	
Post-full closure period (Daily)	6.53	2.74	6	4	

[a]: Kruskal–Wallis; [b]SD: Standard deviation; [c]IQR: Interquartile range

Table 3. Pairwise comparisons of patient numbers between periods who admitted to the emergency department, were hospitalized to the pandemic service from the emergency department, were hospitalized to the intensive care unit from the emergency department, and hospitalized to the both pandemic service and intensive care unit from the emergency department

	p[a]
Patients Admitted to the Emergency Department	
Pre-full closure period-full closure period	**0.001**
Pre-full closure period-post-full closure period	**0.001**
Full closure period-post-full closure period	**0.001**
Patients Hospitalized to the Pandemic Service from the Emergency Department	
Pre-full closure period-full closure period	**0.001**
Pre-full closure period-post-full closure period	**0.001**
Full closure period-post-full closure period	**0.001**
Patients Hospitalized to Intensive Care from the Emergency Department	
Pre-full closure period-full closure period	0.077
Pre-full closure period-post-full closure period	**0.001**
Full closure period-post-full closure period	0.017
Patients Hospitalized to the both pandemic service and Intensive Care Unit from the Emergency Department	
Pre-full closure period-full closure period	**0.001**
Pre-full closure period-post-full closure period	**0.001**
Full closure period-post-full closure period	**0.001**

[a]: Mann–Whitney U

intensive care units.[5] For this reason, partial and full closure methods have been applied, among the social isolation methods, to prevent virus transmission.

In our study, we found that emergency department admissions were lowest in the post-full closure period compared to the full closure period and the pre-full closure period. In a study in Switzerland, Hangartner et al.[8] found that the rate of patient admissions to the internal medicine outpatient clinic was 30% between 2017 and 2019, but this rate decreased to 25% in 2020; on the other hand, they found that emergency department patient admissions were 65% between 2017 and 2019, but increased to 71% in 2020. They stated that the increase in outpatient clinic visits between the peak periods of the pandemic and the increase in the patient density in the emergency department during the peak periods caused this. The high number of patient admissions to the emergency departments during the pre-full closure period in our study may be due to the peak period of the pandemic. The previous studies have shown that, although there is a decrease in non-pandemic hospital admissions due to fear of infection and psychological stress factors, there is an increase in total hospital admissions.[7,9,10] In addition, another study showed low support and commitment to social isolation.[11] The fact that people do not comply with social isolation and hygiene in the pre-full closure period may be the reason for the density of patients in this period. In our study, the reason for the decrease in hospital admissions in the post-full closure period may be the breaking of the social cross-infection chain thanks to social isolation, the increased awareness of the viral pandemic as a result of people spending more time at home, paying more attention to their hygiene, and increasing time spent on social media.

In our study, we determined that the number of hospitalizations in the pandemic services was the highest in the pre-full closure period and the lowest in the post-full closure period. In a study conducted in Türkiye, pre- and post-pandemic patient applications were evaluated, and it was emphasized that there was an increase in both the number of emergency department admissions and especially the infection and pulmonary diseases service hospitalizations.[12] In the same study, it was stated that the rate of hospitalization increased due to the fact that COVID-19 disease caused pneumonia.[12] The high number of pandemic service hospitalizations before the closure may be the effect of the rapidly advancing process on viral pneumonia, and the failure to prevent the transmission of the virus as a result of social non-compliance with social isolation and hygiene measures may be another factor. The reason for the decrease in the number of patients after full closure may be due to the decrease in the number of individuals afflicted with the disease as a result of the effect of strict social isolation policies on the transmission step of the disease, and thus the prevention of the progression of the disease.

In our study, we found a decrease in intensive care hospitalizations in the post-full closure period, compared to the pre-full closure period and the full closure period. However, there was no difference between the intensive care unit hospitalizations in the dual analysis of the pre-full closure period and the full closure period. Approximately 5% of COVID-19 patients and 20% of hospitalized patients show symptoms requiring intensive care.[13] Cytokine storm seen on the 5th–7th day in symptomatic COVID-19 patients progresses to acute respiratory distress syndrome and causes increased intensive care hospitalizations and mortality.[14] The decrease in intensive care hospitalizations in the post-full closure period in our study may be because the total closure method reduced the number of patients in the pre-cytokine storm stage. In the literature, it has been determined that the incubation period of COVID-19 disease is 5.1 days on average.[15] The contagiousness of the symptomatic group is 11.5 days.[15] For this reason, it is known that COVID-19 can be contagious even after 14 days of active monitoring and quarantine.[15] In our study, the number of intensive care patients was close to each other between the pre-full closure period and the full closure period may be due to the fact that the patients in the window period continue to transmit the disease. In a study conducted in the early stages of the COVID-19 pandemic, it was found that there was a shortage of intensive care beds in Brazil due to the increase in intensive care hospitalizations and disruptions in hospital functioning.[16] This may be due to the increase in cross-infections in populations, the lack of effective treatment for COVID-19 disease, and the rapid worsening of disease to acute respiratory failure after pneumonia affects the lower respiratory tract.

Limitations

The inability of our study to provide an analysis of mortality is a limitation. Therefore, we could not detect the differences in seasonal mortality rates. Another limitation is that we did not evaluate the number of patients come into the hospital for non-pandemic reasons, the number of admissions to the emergency department, and the rates of hospitalization in the service and intensive care unit. On the other hand, since the study was conducted retrospectively, ICD numbers in the data recording system were taken into account. This resulted in the non-inclusion of patients with COVID-19 disease, who did not enter the specified ICD number.

CONCLUSION

As a result, we found that the full closure process, which is one of the social isolation methods, reduces the emergency department patient density and the rates of hospitalization in the pandemic service and intensive care unit. Considering that viral pandemics have been seen throughout history, we think that social isolation methods during pandemic periods contribute positively to the reduction of patient density in hospitals, especially in emergency departments. Multicenter and large population studies are needed on this subject.

Disclosures

Ethics Committee Approval: The study was approved by the KTO Karatay University Non-Pharmaceutical and Medical Device Research Ethics Committee (No: 2022/031, Date: 01/03/2022).

Peer-review: Externally peer reviewed.

Authorship Contributions: Concept: G.Y.; Design: G.Y., A.U.; Supervision: G.Y., İ.A.; Funding: M.A., H.G.U.; Materials: G.Y., A.U., İ.A.; Data Collection or Processing: G.Y., A.U., H.G.U.; Analysis or Interpretation: G.Y., M.A., İ.A.; Literature Search: G.Y., A.U., M.A., İ.A., H.G.U.; Writing: G.Y., A.U., M.A., İ.A., H.G.U.; Critical review: G.Y., M.A., H.G.U.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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