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Impact of the lockdown in the pandemic period on admissions due to non-COVID-19 pneumonia: A retrospective, cohort study

Lockdown on non-COVID pneumonia in pandemic

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Abstract

Aim: The pandemic period has led to social and individual behavioral changes all over the world. In this study, the differences in the admissions of non-coronavirus disease 2019 (non-COVID-19) community-acquired pneumonia cases during the pandemic lockdown period in Turkey were analyzed.

Material and Methods: Patients with suspected COVID-19 and under the age of 18 were excluded, and non-COVID-19, hospitalized community-acquired pneumonia cases were included in this retrospective, cohort study. The analyzes were carried out by creating two groups as before the pandemic (March-May 2019) and the lockdown period of the pandemic (March-May 2020). The number of admissions and mortality rates were taken into consideration as primary outcomes.

Results: There were 178 cases in the 2019 group and 63 cases in the 2020 group. Gender and age distribution were similar in these two groups. While the rate of intensive care hospitalization was high in the 2020 group, mortality was low (14.3% vs 19.1%); but these differences were not statistically significant. In addition, bilateral infiltration rates were significantly higher in the 2019 group (80.9% vs. 22.2%; p<0.001).

Discussion: The low number of admissions during the lockdown period shows that there is awareness of the pandemic in society. Again, it can be said that this closure process plays a role in reducing the transmission of infectious diseases such as pneumonia.

Keywords

Pandemic, Lockdown, Isolation, Admission, Pneumonia

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Introduction

Community-acquired pneumonia (CAP) is the most important cause of hospitalization and mortality [1]. It is one of the most common infectious diseases worldwide [2]. Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-Cov2) infection that occurred in Wuhan, China in December 2019 spread rapidly and caused a pandemic, and the disease was named COVID-19 (Corona Virus Disease 2019) in February 2020 by the World Health Organization (WHO) (https://www.who.int/director-general/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020; access date: 12.02.2020). This period has greatly changed human behavior in society and has significantly reduced the crowding of people in public areas such as hospitals.

With the announcement of the pandemic, each country determined its own isolation and lockdown practices. COVID-19 cases in Turkey were first seen on March 11, 2020. After this date, the Ministry of Health imposed flexible working hours, intermittent curfew, and administrative leave for those with comorbid diseases, in addition to social distancing, self-isolation and frequent hand washing warnings. Entrance to crowded and closed areas, meetings, entrance to sports halls were prohibited. On March 21, a curfew was imposed on the population over the age of 65 and under the age of 20. These prohibitions were canceled along with the process of normalization on June 1, 2020. During this period, all communication ways were used by the Ministry of Health to announce the isolation and disinfection methods to the public. In order to maintain the operability of the health system, the public was informed and admissions to hospitals were reduced for non-urgent reasons.

In this study, the authors aimed to compare the lockdown period in 2020 and the period of the same months in 2019 (before the pandemic) in terms of the number of admissions, mortality and intensive care unit admission rates of the non-COVID-19 CAP patients and to investigate the effect of pandemic measures on the admissions of non-COVID CAP patients requiring hospitalization.

Material and Methods

This observational, retrospective, cohort study was carried out in a training and research hospital specialized in chest diseases. Approval for the study was obtained from the ..... XXXXXXXXXX..... Local Ethics Committee (28.05.2020/ 675). In accordance with the retrospective design, informed consent was not obtained from the patients.

Non-COVID-19 CAP patients admitted and hospitalized between 11 March-31 May 2019 and 11 March-31 May 2020 were included in the study. The diagnosis of CAP was made with the presence of cough, sputum, fever or shortness of breath, high levels of inflammatory biomarkers (increased C-reactive protein, leukocytosis, high procalcitonin) and infiltration on chest x-ray. Patients under 18 years of age, and pregnant patients were excluded from the study for all periods, and patients with suspected COVID-19 according to radiologic signs were excluded from the number of patients admitted during the pandemic period. In the institution where the study was conducted, COVID-19 differential diagnoses were evaluated according to radiological findings due to the difficulty in accessing the COVID-19 PCR test during the period of March-May 2020 (the period when the pandemic began in Turkey). Thus, no PCR testing was performed on the patients in this study. Thoracic computed tomography was performed in patients in whom the differential diagnosis of COVID-19 could not be made on the basis of clinical findings and chest X-ray. Patients with peripheral, bilateral (multilobar) ground glass opacities (GGOs), multifocal round GGOs on tomography were excluded as typical COVID-19 pneumonia. In addition, round or non-peripheral multifocal, diffuse, perihilar or unilateral GGOs and a small number of small round and non-peripheral GGOs were also excluded as an atypical involvement of COVID-19 (atypical cases). Patients discharged from the hospital within the last 15 days (hospital-acquired pneumonia) and who meet the definition of healthcare associated pneumonia were excluded. Exclusion and inclusion criteria were shown in Table 1. Age, gender, and additional comorbid disease data of the patients were recorded. Chest x-ray findings were divided into 3 groups as unilateral, bilateral and minimal infiltration. Additionally, intensive care admission, discharge and mortality rates were recorded. The hospitalized non-COVID-19 CAP patients were divided into two main groups according to the years of 2019 and 2020. Comparative analyzes were carried out among these two groups. Patient data were obtained retrospectively from the hospital information management system and patient follow-up files.

The data were analyzed with SPSS Statistics for Windows, version 16.0 (SPSS Inc., Chicago, Ill., USA). The normality analyzes of the data were performed with the Shapiro-Wilk test. Data were expressed as mean ± standard deviation and median and interquartile range in terms of distribution. Analyses of the categorical data were performed using the Chi-Square tests. The Mann Whitney-U test was used to compare the continuous data, which were not normally distributed. $P<0.05$ level was accepted statistically significant.

Results

This study included 178 patients hospitalized in March-May 2019 and 63 patients hospitalized in March-May 2020 with the diagnosis of community-acquired pneumonia. Analysis was performed between these two groups. The median age for the year of 2019 was 70 (min-max: 18-91), and 65 (min-max: 21-90) for 2020 ($p=0.080$). In 2019, 66.3% (n=118) of the patients were 65 years and older, and 50.8% (n=32) in 2020 ($p=0.029$). There was no statistically significant difference in terms of gender distribution between 2019 and 2020. The female rate was 32.6% in 2019 and 33.3% in 2020 (Table 2).

There was no statistical significance in terms of the total comorbidity rate. However, when analyzed by common diseases groups one by one, the rates of hypertension (HT), coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD) and chronic kidney disease (CKD) were statistically lower in 2020 ($p<0.001$, $p=0.033$, $p<0.001$, $p<0.001$, respectively) (Table 2).

When chest x-rays were evaluated, the rate of bilateral pneumonic infiltration was higher in the 2019 group ($p <0.001$). The atelectasis rate was statistically lower in 2020 ($p=0,006$). Sputum culture and/or tracheobronchial culture were sent in

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Community acquired pneumonia (symptoms, radiological and biochemical signs)	All groups
Hospitalized patients	Pregnancy
Over 18 years of age	Younger than18 age
All gender	Hospital-acquired pneumonia
	Healthcare-related pneumonia
	For pandemic period
	COVID-19 related radiological signs

Table 2. Comparative analysis of the demographic characteristics of the two groups

Parameters		Periods		Chi-square test
		2019- n (%)	2020- n (%)	p-value
Female gender		58 (32.6)	21 (33.3)	0.913
Age (year)- med (IQR)		70 (58-78)	65 (53-76)	0.080*
≥ 65 years of age		118 (66.3)	32 (50.8)	0.029
Comorbidities		159 (89.3)	52 (82.5)	0.161
Comorbid diseases	HT	95 (53.4)	15 (23.8)	<0.001
	DM	50 (28.1)	15 (23.8)	0.511
	CAD	56 (31.5)	11 (17.5)	0.033
	COPD	122 (68.5)	18 (28.6)	<0.001
	Malignancy	30 (16.9)	8 (12.7)	0.437
	CKD	31 (17.4)	0 (0.0)	<0.001
	Connective tissue diseases	5 (2.8)	0 (0.0)	0.330**
	CHF	38 (21.3)	6 (9.5)	0.037
	Other	16 (9.0)	26 (41.3)	<0.001

*Mann Whitney-U test; **Fisher Exact test; Med: Median; Min: Minimum; Max: Maximum; IQR: Interquartile range; HT: Hypertension; DM: Diabetes mellitus; CAD: Coronary artery disease; COPD: Chronic obstructive pulmonary disease; CKD: Chronic kidney disease; CHF: Congestive heart failure

Table 3. Chest X-ray signs and primary outcomes

Parameters		Periods		Pearson Chi-square test
		2019- n (%)	2019- n (%)	p-value
Chest X-ray infiltration	Minimal infiltrations	5 (2.8)	18 (28.6)	<0.001
	Unilateral infiltrations	29 (16.3)	31 (49.2)	
	Bilateral infiltrations	144 (80.9)	14 (22.2)	
Other chest X-ray signs		131 (73.6)	38 (60.3)	0.048
Other chest X-ray signs	Pleural fluid	51 (28.7)	14 (22.2)	0.323
	Cavity	7 (3.9)	7 (11.1)	0.055*
	Bronchiectasis	56 (31.5)	12 (19.0)	0.060
	Mass	36 (20.2)	6 (9.5)	0.054
	Atelectasis	61 (34.3)	10 (15.9)	0.006
	Pneumothorax	0 (0.0)	1 (1.6)	0.261*
	Nodules	0 (0.0)	1 (1.6)	0.261*
Intensive care unit admission		18 (10.1)	12 (19.0)	0.065
Mortality (in-hospital)		34 (19.1)	9 (14.3)	0.391
Mortality in age groups	<65 years	6 (10.0)	1 (3.2)	0.415
	≥65 years	28 (23.7)	8 (25.0)	1.000
Culture test performed		73 (41.0)	29 (46.0)	0.553
Isolated agent in culture		25 (34.2)	3 (10.3)	0.015

*Fisher Exact test; Med: Median; Min: Minimum; Max: Maximum; IQR: Interquartile range; HT: Hypertension; DM: Diabetes mellitus; CAD: Coronary artery disease; COPD: Chronic obstructive pulmonary disease; CKD: Chronic kidney disease; CHF: Congestive heart failure

41% of patients in 2019 and 46% of patients in 2020 (p=0.553). In the analysis of the patients who were sent culture, factors were isolated in 34.2% in 2019, and in 10.3% in 2020 (p=0.015) (Table 3).

There were no statistically significant differences between 2019 and 2020 groups according to the intensive care unit admission (10.1/12.0%, p=0.060) and mortality rates (19.1/14.3%; p=0.390). When the mortality rate was analyzed separately in age groups, there was no statistically significant difference (Table 3).

Discussion

COVID-19 pneumonia has shown its effects around the world and has led to significant behavioral changes both socially and individually in Turkey. Restrictions and lockdown practices applied during the pandemic period even affected hospital admissions. In this study, we found that the rate of non-COVID community-acquired pneumonia admission increased during the March-May 2020 lockdown period. Community-acquired pneumonia is one of the leading causes of mortality worldwide [1]. The frequency of CAP varies seasonally. In previous studies, it was found that due to the cold air CAP hospitalizations increased in winter, decreased in summer and varied in spring [3,4]. Our study was conducted in the spring months, and the air temperatures varied during this period. However, since the same period is valid for both years, seasonal variability is not decisive for this study.

In the EPIC study, it was observed that hospitalizations due to CAP were 4 times higher in the 50-64 age group, 9 times higher in the 65-79 age group and 25 times higher in the over 80 age group compared to the 18-49 age group [1]. In our study, although patient admission over 65 years of age was higher (n = 118) in 2019 similar with the literature, this number was found to be low in 2020 (n=32). Along with the quarantine, which was applied at different levels all over the world during the pandemic period, intermittent lockdown, ban on entrance to crowded environments, the closure of schools and universities, and the lockdown for those aged 65 years and above who are the high-risk age group, were applied. In our study, we think that this approach has an effect on the decrease of the number of hospitalizations over 65 years of age. In addition, with the curfew imposed under the age of 20, it was planned to reduce both household transmission to the older people and to reduce crowding in daily life. A significant decrease was found in the total number of patients admitted to our hospital due to CAP during the pandemic period compared to the same period in 2019. We thought that these measures reduced social contact so that normal seasonal pneumonia transmission might have decreased. In addition, as in the rest of the world, due to the COVID-19 quarantine, the factories stopped working, resulting in a reduction in vehicle use and carbon emissions and improved air quality [5]. Increased air quality may also have been effective in reducing the frequency of infections, however there is no data on this subject in this study.

Studies have shown that vaccination against pneumonia at a young age and in children has a protective effect on the elderly [6-8]. Similarly, it suggests that the closure of schools during the pandemic period and the lockdown of the group under the

age of 20 reduced the carrier and domestic transmission of pneumonia factors other than SARS CoV-2.

In our study, comorbidity prevalence in the CAP group other than COVID-19 was 89.3% in 2019 and 82.5% in 2020. In the previous study conducted in Nepal, this rate was found to be 63.4%, and it was found that the most common comorbidity was COPD [9]. In this study, we found that there was no statistically significant difference in terms of total comorbidity in patients hospitalized for CAP between two years. However, when evaluated individually, we found that CAD, COPD, CKD and HT were significantly less in 2020 cases. Based on these results, it can be said that especially those with comorbid disease paid more attention to follow the measures. Similarly, more complicated findings on chest X-ray such as bronchiectasis, pleural fluid and atelectasis were found more in 2019. Underlying lung disease and modifying factors (comorbidities) that cause complicated course of pneumonia are effective. When these two variables are considered together, it can be said that patients with comorbid diseases pay more attention to isolation. As concomitant comorbidity decreased, the complicated findings detected on the chest X-ray decreased. In addition, bilateral pneumonia was mostly detected in chest radiographs in 2019, while minimal infiltration and unilateral pneumonia were detected more in 2020. The reason for this may be due to the fact that the modifying factors are less in 2020, and because of the pandemic period, patients with bilateral infiltration were followed up in COVID-19 suspected patient areas. More studies with larger numbers of cases are needed to evaluate this issue more clearly.

There was no significant difference between the two years in terms of mortality and need for intensive care. As expected, mortality was higher in the 65-year-old group, but when the age groups were analyzed separately, no significant difference was found between the 2019 and 2020 groups. While Jain et al. expressed an in-hospital mortality rate of 2% [1], it is stated in the literature that this rate can reach 28.8% in severe patients [10]. In the study by Şener et al., it is seen that mortality is high (13.7%), however, the median age is 77 [11]. The high mortality rate found in our study can be attributed to the inclusion of only hospitalized patients. In addition, higher rates have been identified in advanced age, as expected.

The limitations of the study are that it is single centered and retrospective. In multi-center and prospectively designed studies, the effects of quarantine practices can be analyzed better. The main limitation should be considered that the radiologic findings, used in the differentiation of PCR-negative cases in the study, are not the gold standard for diagnosis of COVID-19 pneumonia.

Conclusion

In conclusion, in this study, a significant decrease in the number of patients admitted to our hospital with a diagnosis of non-COVID CAP during the pandemic period was detected, however, it is noteworthy that there was no difference in mortality between two years. The COVID-19 pandemic is a very popular topic and we anticipate that there will be many studies on the differences and similarities between COVID-19 pneumonia and non-COVID pneumonia in the near future. It is obvious that lockdown practices have many psychosocial, environmental, and economic consequences, but as shown in this study, they may have reduced the incidence of non-COVID CAP. We can say that awareness of the pandemic takes place in society. Although there is no clear data about any parameter that can be shown as the reason for this decrease, such as the use of masks and the social distance rule. There is a need for multicenter and multinational studies on CAP, which investigate the results of lockdown practices in these outbreaks.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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