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# Ophthalmic Emergencies and Effects of Different Quarantine Models During the COVID-19 Pandemic

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**Background:** The aim of this study was to evaluate the epidemiological features of the patients admitted to our emergency department (ED) during the COVID-19 pandemic in March, April, and May 2020, compare them with the patients in March, April, and May 2019, and to investigate the effect of various quarantine models.

**Material/Methods:** The records of 1206 eligible patients were reviewed. Age groups were divided according to their quarantine status. We recorded the reasons for patient presentation to the ED, the average number of patients in age groups according to quarantine days, and the problems reported by patients who presented to the ED according to quarantine days.

**Results:** We enrolled 3016 of 3123 patients. The mean age was  $36.4 \pm 17.3$  years in 2019 and  $37.8 \pm 16.4$  years during the pandemic period ( $P=0.031$ ). While 73.1% of the ED presentations were due to ocular trauma in 2019, it decreased to 70.7% in 2020. The proportion of those who presented to the ED during the weekend was 30.6% in 2019, but decreased to 23.9% in 2020 ( $<0.001$ ). While 84.8% of trauma patients were ages 19-64 years in 2019, this rate increased to 88.9% during the pandemic ( $P=0.067$ ). Non-trauma emergencies were more common than trauma emergencies in both periods in those over the age of 65 years. During the pandemic period, admissions to the ED were decreased in the quarantined age groups ( $P=0.001$ ).

**Conclusions:** The changes in the number and characteristic of admissions for ophthalmic emergencies during the pandemic period may help planning allocation of healthcare personnel and resources in outpatient and emergency clinics.

**Keywords:** **Coronavirus • COVID-19 • Emergencies**

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## Background

Coronavirus is one of the pathogens known to infect humans. It previously caused fatal respiratory system infections with MERS-CoV and SARS-CoV [1]. The new SARS-CoV-2, which emerged for the first time in Wuhan province China at the beginning of 2020, has caused a pandemic all over the world and, to date, more than 53 million people have been infected in 220 countries, according to the World Health Organization. During this pandemic, the lack of intensive care facilities and personal protective equipment has emerged all over the world [2-5]. However, due to the insufficient numbers of test kits and their low sensitivity, it was difficult to detect infection [6]. Therefore, health authorities of many countries decided to stop performing elective surgeries and providing routine outpatient services [7-9]. In addition to ceasing to perform elective surgeries, the Ministry of Health in Turkey also decided to perform only emergency surgeries and cancer surgeries. During this period, ophthalmology clinics in pandemic hospitals stopped routine patient admission and generally dealt only with emergency cases. During the pandemic period, many countries in the world have used different approaches. While some countries implemented a complete quarantine, others did not implement any special policies. From March, in which the first cases emerged, until the beginning of June in Turkey, only people 18 years old and under and those 65 years old and over were completely quarantined. The individuals between 19 and 64 years old had a full quarantine at weekends. In accordance with the rotational work policies of the workplaces, they worked rotationally during weekdays.

This study aims to investigate the effects of the pandemic and the related regulations on people with ophthalmic emergencies who presented to the ED of the tertiary reference hospital of Bursa Uludağ University, School of Medicine in Bursa with regard to the age groups, pandemic periods, and quarantine periods.

## Material and Methods

The files of 1206 subjects who were admitted to the ED with ophthalmic problems in March, April, and May 2020, the period when the curfew was applied on weekdays for individuals aged 18 and under and individuals aged 65 and over, and on weekends for individuals of all age groups, were reviewed. Taking into account the effect of time periods on ED presentations, the files of 1917 patients who were admitted in the same period in 2019 (March, April, May) were also reviewed retrospectively. The data of 3016 patients out of 3123 (1206 in 2020 and 1917 in 2019) patients who were admitted to the Adult Emergency and Pediatric Emergency Departments were retrospectively evaluated. The study complied with the

Declaration of Helsinki. The Institutional Ethics Committee of Bursa Uludağ University, School of Medicine approved the study.

The demographic features of the patients, the effects of the curfew on the ophthalmic emergency presentations, and medical problems at the time of presentation of patient groups who were subject to curfew both on weekdays and at the weekends and the effect of curfew on ophthalmic emergency presentations of all patient groups at the weekends were analyzed, and these data were compared with the ED presentations in 2019.

### Groups Included in the Study

The subjects were separated into 3 age groups in terms of the quarantine status: 18 years and under, 19-64 years old, and 65 years and over. The full quarantine group consisted of patients aged 18 and under and 65 and over; the less-quarantined group consisted of the patients ages 19-64 years.

The groups were further divided into 5 subgroups, with 2 groups in 2019 and 3 groups in 2020. The year before the pandemic, the March, April, and May 2019 period was divided into 2 groups as weekdays and weekends. In the pandemic year (2020) in March, as the subjects 18 years age and under and 65 years and over were quarantined, weekdays in March were delineated as semi-quarantine weekdays group, and weekends in March were considered as semi-quarantine weekends group. In April and May 2020, weekdays were considered as semi-quarantine weekdays, while weekends and officially quarantined days for all age groups were considered full quarantine. Since quarantine was not applied to all groups on the last weekend of May, it was considered as a semi-quarantine weekend, like weekends in March. The groups are listed in **Table 1**.

### Statistical Analysis

SPSS 23 program (©IBM, International Business Machine, Armonk, NY, USA) was used for data analysis. The normality of distribution was determined by the one-sample Kolmogorov-Smirnov test. Descriptive statistical methods were used for demographic data. The Pearson chi-square test was used for comparison of age groups, patient-reported problems at time of presentation to the ED, and ED presentation times. The Kruskal-Wallis test was used for statistical comparison of the average number of patients admitted according to quarantine periods. The *t* test was used to compare mean ages between years. The statistical significance was set at  $P < 0.05$ .

## Results

After detection of the first coronavirus case in March 2020, when the quarantine measures were implemented during the

**Table 1.** The patient groups included in the study in March, April, and May 2019 and 2020.

2019 weekday group	The patients applied in March, April, May weekdays in 2019
2019 weekend group	The patients applied in March, April, May weekend in 2019
Semi quarantine weekdays group in 2020	The patients applied in March, April, May in weekdays in 2020 (except the full quarantine days)
Semi quarantine weekend group in 2020	The patients applied in all weekends in March, and the last weekend of May in 2020
Full quarantine group in 2020	The patients applied in full quarantine days in April, May in 2020

**Table 2.** The distribution of ophthalmic emergency presentations of different age groups in March, April, and May 2019 vs 2020.

	2019 March, April, May		2020 March, April, May		P value
	N	Percentage (%)	N	Percentage (%)	
≥18 years	267	14%	107	9%	<0.05**
19-64 years	1483	80%	982	85%	<0.001*
≤65 years	105	6%	72	6%	>0.05**

N – number of patients. \* Pearson Chi square test; \*\* Z test.

COVID-19 pandemic, the ED presentations of ophthalmic emergency patients were retrospectively compared with the presentations of the same months of the year before. We enrolled 3016 of 3123 patients in the study. While the number of presentations to the ED was 1855 in 2019, this number was 1161 in 2020, which was 37.4% lower. The mean age of patients who applied during the pandemic was  $37.8 \pm 16.4$  years, while the mean age of the patients who applied in same time interval in 2019 was  $36.4 \pm 17.4$  years. The groups were significantly different with respect to mean age ( $P=0.031$ ,  $t$  test). The sex distribution was similar in 2019 and 2020, with females accounting for 21%. The right eye involvement was 48.5% and the left eye involvement was 45.9%, and involvement of both eyes was 5.6% in 2019, whereas these rates were 47% for right eye, 48.1% for left eye, and 4.9% for both in 2020.

From March to May, when the quarantine was actively applied, there was a decrease in the number of ophthalmologic emergency presentations in 2020 compared to the previous year. We compared the total number of patients in each month in 2019 vs 2020 (chi-square test). While the ED presentation rates were 37% (678 patients) in March, 29% (544 patients) in April, and 34% (633 patients) in May in 2019, the rates were 40% (465 patients) in March, 24% (283 patients) in April, and 36% (413 patients) in May in 2020. The change in distribution of the ED presentation rates was statistically significant ( $P=0.01$ , Pearson chi-square). The ED presentation rate in April 2019 was significantly different than the rate in April 2020 ( $P<0.05$ , Z test).

Within the scope of pandemic measures, a curfew was imposed on individuals aged 18 and under and 65 and over on weekdays, and a curfew was imposed on all individuals on weekends. During the pandemic period, at the weekends when quarantine was implemented in all ages, a decrease was noted in the ED presentation rates at the weekend. When all ED presentations were evaluated, the weekend ED presentation rate was 30.6% in 2019, while it was 23.9% in 2020. This difference was significant between 2019 and 2020 ( $P<0.001$ , Pearson chi-square). In 2019, the highest number of presentations was on Saturday (17%). The highest number of ED presentations during the pandemic was on Wednesday (16.5%) followed by Friday (16.0%) ( $P<0.001$ ). The ED presentation rate on Saturday was 12% and 11.9% on Sunday during the pandemic.

The rate of ophthalmic ED presentation decreased in 2020 compared to 2019 in the groups aged 18 and under and 65 and over, who were permanently quarantined ( $P=0.001$ , Pearson chi-square test). The ED presentation rates of patients under 18 years significantly decreased in 2020 (Table 2).

The rates of various reported eye problems among people presenting to the ED for ophthalmic diseases in both periods are given in Table 3. Ocular trauma was the most common problem in both periods in all age groups.

In 2019, 84.8% of ocular trauma cases were observed in the 19-64 age group, while this rate increased to 88.9% during the pandemic period ( $P=0.067$ ). When the age group 18 and under was examined, 13% of ophthalmologic emergency admissions

**Table 3.** The reasons for emergency department presentations in March, April, and May in 2019 and 2020.

Complaints	2019		2020		Z test
	Number	Percentage (%)	Number	Percentage (%)	P value
Ocular trauma	1356	73.1%	821	70.7%	>0.05
Ocular infection	181	9.8%	112	9.6%	>0.05
Pain/burning/stinging	140	7.5%	118	10.2%	<0.05
Sudden vision loss	113	6.1%	69	5.9%	>0.05
Uveitis	39	2.1%	27	2.3%	>0.05
Flashing light/floating bodies	18	1.0%	7	0.6%	>0.05
Glaucoma	4	0.2%	2	0.2%	>0.05
Diplopia	4	0.2%	5	0.4%	>0.05
<b>Total</b>	<b>1855</b>	<b>100.0%</b>	<b>1161</b>	<b>100.0%</b>	

**Table 4.** The average number of patients in age groups according to quarantine days.

	18 years and under		19-64 years		65 years and over	
	AV	SD	AV	SD	AV	SD
2019-WD group	3.3	2.0	15.5	4.6	1.3	1.0
2019-Wend group	3.6	1.7	17.7	5.1	0.9	0.8
2020-½-quarantine WD group	1.4	1.1	11.2	4.6	0.8	0.8
2020-½ quarantine Wend group	1.4	1.1	10.4	4.7	1.2	1.0
2020-full quarantine group	1.4	1.2	9.9	5.2	0.7	0.8
P value*	<0.001		<0.001		<0.001	

WD – weekday; Wend – weekend; ½ – semi; AV – average; SD – standart deviation. \* One way anova.

in 2019 were ocular traumas in the pediatric age group, while this rate was 7% in 2020.

In patients who were quarantined (<18 and >65 years), admission with ocular trauma was 15% in previous year, while this rate decreased significantly to 11% during the pandemic (P=0.007). The number of ED visits with non-traumatic complaints of the age 65 and older was higher than the number of visits with traumatic causes.

In 2019 and 2020, the most common cause of ophthalmic emergencies was ocular trauma followed by ocular infection in 2019 and followed by pain-stinging-burning problems in 2020 (Table 3).

While the patient concerns of pain-stinging-burning in the quarantine group accounted for 29% of the ED presentations in 2019, this rate decreased to 22% during the pandemic period (P=0.119).

While the ED presentation rate due to ocular infection was 39% before the pandemic in patients in the quarantine group, it decreased to 30% during the pandemic period, which was not statistically significant. Also, no significant difference was noted between 2019 and 2020 in the patients who constituted the quarantine group in terms of sudden vision loss and other problems (eg, diplopia, glaucoma, uveitis, flashing lights).

According to the quarantine days, the average daily number of patients presenting due to ophthalmic emergencies in different age groups is given in Table 4. The average daily number of patients was 20.6±4.9 patients in 2019 and 12.9±5.3 in 2020. Table 5 shows the average daily number of patients applying due to eye diseases and the average number of patients with different ED presentation problems according to the quarantine days.

## Discussion

During extraordinary periods in our world, admissions to hospitals may increase and decrease. The coronavirus pandemic

**Table 5.** The average number of patients who presented to the emergency department with different health problems according to quarantine days.

	Average of daily patients		Trauma		Infection		Pain/burning/stinging		SVL		Other complaints	
	AV	SD	AV	SD	AV	SD	AV	SD	AV	SD	AV	SD
2019-WD group	20.2	4.9	13.3	4.2	2.2	1.9	1.7	1.5	1.3	1.2	0.7	0.9
2019-Wend group	21.7	5.0	17.6	5.7	1.1	1.0	0.8	0.7	0.8	0.9	0.5	0.8
2020-½-quarantine WD group	13.7	5.1	8.9	3.6	1.3	1.4	1.6	1.6	0.8	1.0	0.5	0.7
2020-½-quarantine Wend group	14.8	5.4	11.9	4.4	0.9	0.7	0.7	0.6	0.5	0.9	0.3	0.5
2020-full quarantine group	9.3	4.2	7.3	3.5	0.7	0.7	0.4	0.6	0.5	0.6	0.2	0.4
P value*	<0.001		<0.001		0.001		<0.001		0.005		0.069	

WD – weekday; Wend – weekend; ½ – semi; SVL – sudden vision loss; AV – average; SD – standart deviation. \* One way anova.

period, which started at the end of 2019 and continued throughout 2020, is such a period.

Wu et al investigated ophthalmic emergency admissions in 2020, when the pandemic started and stay-at-home measures were implemented. They compared the findings with the previous year and found that that the average number of patients per day decreased significantly from 49.0 to 36.4 [10]. A significant decrease was reported in the number of patients presenting for ophthalmic emergency during stay-at-home measures, and the incidence of ocular traumas were stable. Severe ocular trauma was noted in 87 (6.3%) of 1372 patients in 2019 and in 62 (5.9%) of 1058 patients in 2020. When the severe ocular trauma types were compared with those of the previous year, the difference was not statistically significant [10]. They evaluated a 1-month period between March 23 and April 20, while we evaluated a 3-month period. We also evaluated the days with a compulsory quarantine period. In our study, there was a decrease in the number of emergency visits during the pandemic regarding the number of ophthalmologic emergency patient admissions in March to May, when the stay-at-home measures were actively applied, compared to March to May in 2019. While the average daily number of ophthalmic emergency presentations was 20.6 in 2019, we observed that this number decreased to 12.9 during the pandemic period. The rate of ophthalmic emergency presentation decreased from 20% in 2019 to 15% in 2020, which is statistically significant, compared to the previous period in the age groups 18 and under and 65 and over, who were in continuous quarantine. Ocular trauma was the most frequent cause for presentation in both time periods. Ocular trauma constituted 73.1% of the ED presentations in 2019 and 70.7% in 2020. We think that the number of trauma presentations is high because our region is an organized industrial zone and we are the only reference tertiary hospital in the region.

A study conducted by Shah et al assessed and compared the frequency of pediatric ocular trauma in ophthalmological emergencies during the pandemic from March 22 to May 30 in 2020 found that the incidence of pediatric ocular trauma increased during the interval when quarantine measures were implemented [11]. In another study, Pellegrini et al observed 354 eye injuries (15.6% of emergency admissions) in 2019 between March 10 and April 10, while 112 eye injuries (19.9% of all ED presentations) were noted in the same interval in 2020. They found that during quarantine, the proportion of children and adolescents with ocular injuries decreased (from 14.7% to 8.0%) and that the proportion of men increased (from 66.7% to 75.0%). They showed a dramatic reduction in eye injuries (68.4%) during the pandemic period, and predicted that behavioral changes at the time of quarantine would decrease the risk of trauma. They stated that the decrease in sports injuries and injuries in children during school closure supports this hypothesis [12]. Similar to the findings of Pellegrini et al, we also found a significant reduction in eye injuries in patients under 18 years and patients over 65 years. However, there was no significant change regarding ED presentation for ocular trauma in the patients aged 19-64 years, who were not in continuous quarantine. As the outdoor activities of patients under 18 years and over 65 years were restricted due to quarantine, the rate of ocular trauma in these age groups might have decreased. The rate of ocular trauma in the patients age 19-64 years did not significantly change. This finding may be attributed to their relatively unrestricted activities and possible domestic violence.

In the present study, 3016 patients were enrolled and the data were compared over a 3-month interval. We observed that 14% of the ED presentations before the pandemic were in the pediatric group, and this rate decreased to 9% during the pandemic period. In a recent study that compared a COVID-free period with

the COVID period, the ED presentations of patients under 18 years also significantly decreased during the COVID period [13].

A study by D'Oria et al, while validating a new scoring system for the ophthalmic emergency room, reviewed electronic records of 953 patients who visited between April 1, 2018, and May 30, 2018. During the 2-month period, according to their triage score system, 606 of 953 patients who applied to ophthalmic emergency room were classified as non-urgent and 347 were urgent. According to their findings, approximately 36% of the patients did not need to be evaluated at the ophthalmic emergency room [14]. In our study, 1161 patients applied to the ED in the 3-month period in 2020 vs 1855 in 2019. There was a marked decrease in ED presentations when the curfew was applied during the pandemic. This may be attributed to the fact that non-urgent cases might have not applied to the ED during the pandemic and some urgent cases might have hesitated to apply due to concern of possible COVID-19 transmission.

Poyser et al reported an overall 53% reduction in emergency eye department attendance during the lockdown period. They compared a 1-month period (March 24, 2020 to April 23, 2020) during the pandemic with the same period in 2019. They also reported a 46% reduction in trauma-related presentations during the lockdown period [15]. In our study, the overall reduction rate was 37.4%. In addition, 2019 was divided into 2 groups as weekdays and weekends, and 2020 as semi-quarantine weekday, semi-quarantine weekend, and full quarantine. In the period 2020, the distribution of the average number of patients was in accordance with the groups, taking into account that the group aged 18 and under and 65 and over were in quarantine. The average number of patients daily, and the number of patients who applied for trauma, infection, pain/burning/stinging, or sudden vision loss decreased significantly, while the change in the average number of patients admitted for other causes was not significant.

An important limitation of this study is that it analyzed the ophthalmic emergency presentations at a single tertiary hospital. The tertiary hospital of Bursa Uludağ University was the only center in the region that did not stop the admission of patients with ophthalmic emergencies and symptoms; all the other hospitals had all stopped giving medical care to ophthalmic patients at times during the pandemic. This fact might have affected the number of ED presentations. The strength of this study is that it evaluated the ophthalmic emergency presentations in different quarantine models in different age groups.

## Conclusions

To the best of our knowledge, this simple preliminary study is the first to assess changes in the number and characteristic of admission for ophthalmic emergencies during the pandemic period. Further and more complex studies should be conducted in different countries to develop better organization models and to determine the number of health care personnel required in ophthalmology departments. The role of territorial medicine is also very important to treat emergencies initially and to reduce the number of patients who have to go to large, central hospitals.

## Statement

The study was carried out at the Department of Ophthalmology, Bursa Uludağ University.

## Conflict of Interest

None.

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