DOI:10.14744/bej.2022.58966
Beyoglu Eye J 2022; 7(3): 223-230

Original Article

The Effect of COVID-19 Pandemic on Eye-Related Emergency Department Visits: A Comparison of 2-Year Results

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Abstract

Objectives: The aim of this study was to examine the clinical and demographic impact of the COVID-19 pandemic on emergency department admissions to a tertiary eye care hospital.

Methods: Records of admissions to the ophthalmology emergency department during the pre-pandemic period (Group 1) and pandemic period (Group 2) were retrospectively reviewed to cover the period between March 15, 2019, and March 15, 2021. Application numbers, demographic characteristics of patients were recorded. The cases were grouped by age, sex and diagnoses, and the findings were compared within and between the groups.

Results: A total of 161, 941 patients (Group 1: 103, 178 and Group 2: 58, 763) were admitted to the emergency department of our hospital within 2 years. All admission diagnoses were significantly lower in the pandemic period than in the pre-pandemic period (p=0.001). However, the rate of sight-threatening cases or cases requiring urgent treatment (retinal diseases, uveitis, etc.) was significantly higher in the pandemic period than in the pre-pandemic period (p=0.001). The most common admission diagnoses were ocular infectious/inflammatory diseases while the foreign body on the ocular surface/ocular trauma group was second. Admissions for allergic and infectious diseases were significantly less during the pandemic period (p=0.001 and p=0.002, respectively). In both periods, the number of admissions of male patients was significantly higher than that of females. The most frequent applicant age group was the 17–40 years age group.

Conclusion: This observational study reveals the changes caused by the COVID-19 pandemic in ocular emergency admissions. The data from our study may be helpful in planning healthcare delivery during and after the pandemic period.

Keywords: COVID-19, emergency department, eye, ophthalmology, pandemic

Introduction

The Coronavirus-2019 (COVID-19) pandemic has led to major changes in healthcare services as well as the social and economic changes it has caused worldwide (1,2). From March 11, 2020 the day when the first COVID-19 case occurred in Türkiye, serious measures such as quarantine, curfews, and travel bans have been imposed to prevent the spread of the disease throughout the country, especially in major cities. Furthermore, additional measures such as working from home have been encouraged in areas where this is possible. Frontal teaching in schools has been suspended and distance education has been started (3).

How to cite this article: Yilmaz M, Serbest Ceylanoglu K, Malkoc Sen E. The Effect of COVID-19 Pandemic on Eye-Related Emergency Department Visits: A Comparison of 2-Year Results. Beyoglu Eye J 2022; 7(3): 223-230.

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Submitted Date: January 16, 2022 **Accepted Date:** June 05, 2022 **Available Online Date:** August 05, 2022

Measures have been taken by the Turkish Ministry of Health, such as ordering health services to give priority to emergency patients, postponement of elective surgeries, and serving only patients with appointments in outpatient clinics (4). From the beginning of the pandemic period, the Turkish Ophthalmology Association held online meetings on what to be paid attention to in this process, determined the types of surgeries considered urgent, and published comprehensive guidelines on the management of various ocular diseases (5,6). During this period telemedicine services and online video consultations, which allow patients to be examined remotely without coming to the hospital have been increasingly used in many hospitals in our country and around the world (7,8). Hospitalization also decreased significantly during this time and outpatient follow-up and treatment were scheduled whenever possible (9). In addition, the public was urged not to go to hospitals in non-emergency situations (4).

All kinds of health service presentations, from outpatient examination to medical and surgical treatment, were severely affected during the pandemic period (10). During this period, it was reported that ophthalmic patients do not have sufficient access to health care delivery and both medical and surgical treatment services are negatively affected (11,12). On the other hand, positive effects were also observed during this period; for example, eye trauma was reported to be significantly lower during this period (13) and the incidence of contagious eye infections decreased thanks to strict closure policies and greater adherence to hygiene rules and social distance (12). It has even been reported that the incidence of retinal detachments is lower during the pandemic period (14).

The COVID-19 pandemic has led to individual behavioral changes worldwide (15). A study by Shiraly et al.(16) reported that people had less hand-to-face contact during the pandemic period and were more likely to avoid touching mucosal surfaces such as the mouth, nose, and eyes. Furthermore, considering that the use of contact lenses (CL) increases the risk of contracting COVID-19, it was found that the number of people using CL decreased, and the wearing time of CL users was shortened (17,18).

Our study aims to show how the number of patient admissions and admission diagnoses in the emergency department of a tertiary eye hospital were affected by the COVID-19 pandemic.

Methods

Approval was obtained from the local ethics committee for the study (Ankara Training and Research Hospital Ethics Committee, number: E-21–647) and the study was conducted in accordance with the principles of the Declaration of Helsinki. Since data of the patients were obtained retrospectively from the hospital record system, informed consent was not obtained. The records of registrations in the emergency department of our hospital between March 15, 2019, and March 15, 2021, were retrospectively analyzed from the electronic database of our hospital. Patients were divided into a total of eight groups according to the date range. Group 1 Spring period: March 15 - June 15 (n=28 871); Group 1 Summer period: June 15 - September 15 (n=26 232); Group 1 Autumn period: September 15 - December 15 (n=24 245); Group 1 Winter period: December 15, 2019 - March 15, 2020, (n=23 830); Group 2 2020 Spring period: March 15 - June 15 (n=14 275); Group 2 Summer period: June 15 - September 15 (n=20 371); Group 2 Autumn period: September 15 - December 15 (n=13 491); and Group 2 Winter period: December 15, 2020, - March 15, 2021, (n=10 616).

Our hospital is a tertiary eye care hospital where only ocular diseases are evaluated. That's why only patients with eye emergency are admitted to our hospital's eye emergency department. It is open 365 days/24 h and patients presenting with elective complaints such as refractive examination are not admitted to the emergency department.

In the emergency department, the visual acuity was evaluated with a Snellen chart, and biomicroscopic anterior segment and fundus examinations of the patients were performed. Additional ocular imaging and laboratory tests were ordered where necessary. The diagnoses given to the patients were retrospectively evaluated, one by one, by the hospital information management system, and the preliminary diagnoses were grouped and the disease that was the reason for coming to the emergency room was accepted as the main diagnosis. For each patient, one diagnosis was included in the study. Diagnoses other than the main diagnosis, such as secondary glaucoma and dry eye, were not included in the study.

Statistical Analysis

Statistical analyzes were performed using Statistical Package for the Social Sciences version 25.0 software for Windows (IBM SPSS Statistics for Windows. version 25.0. Armonk. NY: IBM Corp. USA). Explanatory statistics of variables were reported as mean±standard deviation and number (%). For the univariate analyzes of the variables, the independent t-test and the Chi-square test were used depending on the type of variables and the availability of the assumptions. In all statistical analyses, cases with $p<0.05$ were interpreted as statistically significant.

Results

The mean age of the 161,941 patients who participated in the study during the entire study period was 36.45±19.02 years. The mean age of patients who arrived during the pan-

demic period (37.19±17.60 years) was higher than before the pandemic (36.06±19.72 years) (p=0.001). The number of patients admitted in the pre-pandemic period (103, 178) was significantly higher than the number of patients admitted in the same post-pandemic period (n=58,763) (p=0.0001). The number of patients admitted to the emergency department within 1 year of the pandemic outbreak decreased by 43.05% compared to the same pre-pandemic period (Table 1, p=0.0001).

Table 1 shows the total number of patients who visited the emergency department by season before the pandemic and during the same period during the pandemic. The number of patients admitted in all seasons decreased significantly during the pandemic period. In terms of the number of patients coming in both periods, during the pandemic period; it was found that the most significant decrease in the number of applications to the emergency service are the spring months with 51.01% and although there is a decrease in the summer months, it is less than other seasons (22.34%) (p=0.0001). In the pre-pandemic period, the season when the highest number of cases reported to the eye emergency room was spring, and it was observed that the number of cases gradually decreased from spring to winter. In the pandemic period, the season when the highest number of cases reported to the eye emergency room was summer, and an increase was observed from spring to summer, and after summer, a decrease in the number of cases was observed toward autumn and winter (Table 1).

In the age group of children; more boys than girls presented to the eye emergency department. In the age groups 17–40 years and 41–64 years, the male to female ratio was approximately 2/1 in both groups (1.73 and 2.08 in Group 1 and Group 2, respectively). There was no significant difference between females and males in the patients 65 years of age and over (Table 2). The highest number of admissions; both in Group 1 and Group 2, were in the age groups 17–40 and 41–64, respectively. In Group 2, the rates of hospital admissions were lower in the age groups 0–16 and 65 and older (12.9% and 5.9%, respectively) than in Group 1 (19.5% and 8%, respectively). The distribution of patients by Group 1 and Group 2 diagnoses is shown in Table 3. According to these results, a significant decrease was observed in all diagnoses during the pandemic period (p=0.0001). The most common and less frequent diagnoses compared to age groups are shown in Figures 1 and 2.

In both the pandemic and pre-pandemic periods, infectious and allergic conjunctivitis were significantly most common in spring; the diagnoses of ocular trauma, foreign bodies on the ocular surface, and stye/chalazion were most common in summer; and the diagnoses of adenoviral and herpetic keratoconjunctivitis were most common in winter. There was no significant difference between seasons for other diagnoses.

Retinal disease, iridocyclitis, and glaucoma were the most common diagnoses after acute conjunctivitis and ocular surface foreign body diagnoses, respectively, in the age group ≥65 years (Fig. 2 and Table 4).

Discussion

There was a numerically significant decrease in eye emergency department visits during the pandemic period in all seasons compared to the pre-pandemic period. The reason for this may be the protective measures against coronavirus or that our patients are more cautious about applying to the emergency department. We think that the information announcements of the Turkish Ophthalmology Association are also guiding in this regard to warn our patients and raise awareness so as not to delay the treatment of emergency eye diseases in our country.

It was found that eye emergency department admission rates due to infectious/inflammatory and allergic diseases decreased most significantly during the pandemic period. In a study by Carvalho et al., (19) it was reported that approximately 55% of patients admitted to the eye emergency department had infectious/inflammatory diagnoses. In our study, infectious/inflammatory causes were the most common admission diagnoses (61.6% and 51.1%, respectively) in both the pre-pandemic and pandemic periods. In our study,

Table 1. Distribution of the number of patients according to the seasons

Period	n (%)	Group 1	Group 2	P*
Spring	43,146 (100)	28,871 (66.91)	14,275 (33.09)	0.001
Summer	46,603 (100)	26,232 (56.29)	20,371 (43.71)	
Autumn	37,736 (100)	24,245 (64.25)	13,491 (35.75)	
Winter	34,456 (100)	23,830 (69.18)	10,626 (30.82)	
Total	161,941 (100)	103,178 (63.71)	58,763 (36.29)	

n: Number of patients, *Chi-square test.

Table 2. Distribution of eye emergency department admissions according to age and sex in Group 1 and 2

Age	Group 1 n (%)	Group 2 n (%)	P*
0–16 years			
Female	8944 (44.4)	3085 (40.6)	0.001
Male	11,205 (55.6)	4506 (59.4)	
Total	20,149 (100)	7591 (100)	
17–40 years			0.001
Female	12,753 (33.7)	7,129 (29.4)	
Male	25,070 (66.3)	17,136 (70.6)	
Total	37,823 (100)	24,265 (100)	
41–64 years			0.001
Female	12,254 (33.2)	7180 (30.7)	
Male	24,702 (66.8)	16,233 (69.3)	
Total	36,956 (100)	23,413 (100)	
≥65 years			0.51
Female	3893 (47.2)	1672 (47.8)	
Male	4357 (52.8)	1822 (52.2)	
Total	8250 (100)	3494 (100)	
All patients			
Female	37,844 (36.7)	19,066 (32.4)	0.001
Male	65,334 (63.3)	39,697 (67.6)	
Total	103,178 (100)	58,763 (100)	

n: Number of patients, *Chi-square test.

the reason for the decrease in infectious and allergic conjunctivitis, and keratitis cases during the pandemic period may be that the decrease in exposure to infectious microorganisms in the external environment and the positive improvements in personal hygiene habits (12,15,16). In view of this result, it would be appropriate to draw attention to this issue by increasing informative and educational efforts on personal hygiene to protect against these diseases and preserve public health.

In a 1-year prospective study conducted by Henriquez

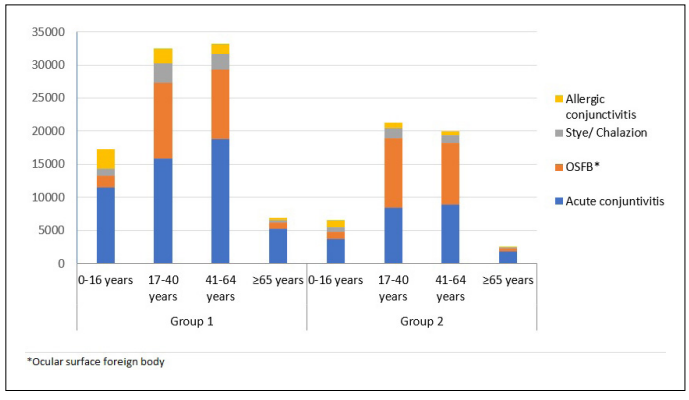

Figure 1. The most frequent diagnosis distribution according to patient age groups in Groups 1 and 2.

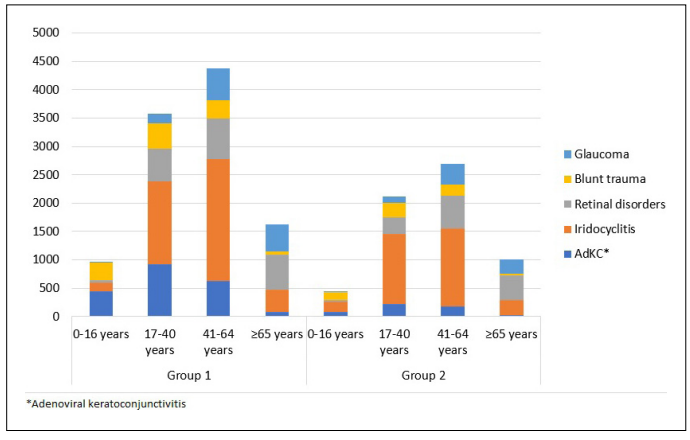

Figure 2. Less frequent diagnoses according to patient age groups in Groups 1 and 2.

Table 3. Number of patients according to diagnosis in Group 1 and 2

Diagnosis	Group 1, n (%)	Group 2, n (%)	P (Group 1–2)
Infectious/Inflammatory			
Acute conjunctivitis	47,754 (46.28)	21,974 (37.39)	0.0001
Iridocyclitis	4154 (4.02)	3059 (5.21)	
Adenoviral Keratoconjunctivitis	2077 (2.01)	515 (0.88)	
Keratitis	907 (0.88)	450 (0.77)	
Herpetic keratoconjuctivitis	768 (0.74)	470 (0.8)	
Episcleritis and Scleritis	620 (0.60)	293 (0.5)	
Preseptal/Orbital Cellulitis	547 (0.53)	338 (0.58)	
Total	63,648 (61.68)	30,627 (52.12)	
Foreign body/trauma			
Ocular surface foreign body	24,942 (24.18)	21,155 (36)	
Blunt eye trauma	1142 (1.11)	618 (1.05)	
Open-globe eye injury	330 (0.32)	151 (0.26)	
Eyelid injury	176 (0.17)	147 (0.25)	
Total	26,590 (25.78)	22,071 (37.56)	
Allergic			
Allergic conjunctivitis	3891 (3.77)	1426 (2.43)	
Vernal conjunctivitis	3284 (3.18)	1140 (1.94)	
Total	7175 (6.95)	2566 (4.37)	
Others			
Retinal Diseases	1,924 (1.87)	1,336 (2.27)	
Conjunctival Hemorrhage	1,416 (1.37)	638 (1.08)	
Glaucoma	1,216 (1.18)	738 (1.26)	
Vitreous Diseases	1,083 (1.05)	699 (1.19)	
Retinal Detachment	126 (0.12)	88 (0.15)	
Total	5,765 (5.59)	3,499 (5.95)	
Total	103,178 (100)	58,763 (100)	

1Chi-square test, The Group 2/Group 1 column defines the ratio of diagnoses during the pandemic period to the pre-pandemic period. Especially infectious and allergic diseases decreased by more than 50% during the pandemic period compared to the pre-pandemic period.

et al. (20) before the pandemic, it was reported that the most common diagnoses for an emergency eye examination in children were infectious conjunctivitis, corneal abrasions, and noninfectious conjunctivitis. In a 1-year prospective study conducted in the pre-pandemic period, Sen et al. (21) reported that children most commonly referred to the emergency room due to allergic and infectious conjunctivitis. In our study, similar to the above studies it was found that children were most frequently admitted to the emergency department for infectious and allergic conjunctivitis, and ocular surface damage due to foreign bodies both before and during the pandemic. Educating parents about preventive measures and raising awareness among school-age children about the prevention and transmission of these diseases can reduce the incidence of these diseases in childhood.

A study by Pellegrini et al. (13) found that there was a significant decrease in eye injuries during the pandemic period due to both occupational and non-occupational causes (sports, violence, falls, etc.). Similarly, in our study, there was a significant decrease in blunt and penetrating eye injuries during the pandemic period. The reason for this decrease could be working from home or rotation system during the

Table 4. Diagnoses according to patient age groups and periods

0–16 years		**17–40 years**	
Group 1 (n)	**Group 2 (n)**	**Group 1 (n)**	**Group 2 (n)**
• Acute Conjunctivitis (11558)	• Acute Conjunctivitis (3721)	• Acute Conjunctivitis (15839)	• Ocular surface foreign body (10514)
• Vernal Conjunctivitis (3054)	• Ocular surface foreign body (1132)	• Ocular surface foreign body (11428)	• Acute Conjunctivitis (8025)
• Ocular surface foreign body (1679)	• Vernal Conjunctivitis (1059)	• Stye and chalazion (3015)	• Stye ve chalazion (1502)
• Stye ve chalazion (1054)	• Stye and chalazion (678)	• Allergic conjunctivitis (1992)	• Iridocyclitis (1227)
• Adenoviral keratoconjunctivitis (448)	• Iridocyclitis (184)	• Iridocyclitis (1466)	• Allergic conjunctivitis (790)
41–64 years		**≥65 years**	
Group 1 (n)	**Group 2 (n)**	**Group 1 (n)**	**Group 2 (n)**
• Acute Conjunctivitis (15888)	• Ocular surface foreign body (9346)	• Acute Conjunctivitis (4469)	• Acute Conjunctivitis (1789)
• Ocular surface foreign body (10505)	• Acute Conjunctivitis (8439)	• Ocular surface foreign body (902)	• Ocular surface foreign body (460)
• Stye ve chalazion (2411)	• Iridocyclitis (1375)	• Retina diseases (618)	• Retina diseases (428)
• Iridocyclitis (2146)	• Stye ve chalazion (1191)	• Conjunctival Hemorrhage (529)	• Iridocyclitis (272)
• Allergic conjunctivitis (1537)	• Retina diseases (572)	• Glaucoma (475)	• Glaucoma (251)

pandemic period. There are studies in the literature reporting that ocular traumas occur mainly in males and between the ages of 15–45 years (22,23). In this study, ocular trauma was found to be most common in males and the 17–40 age group for all age groups, both in the first 1-year period of the pandemic and in the 1 year before the pandemic. To prevent people of working age from being exposed to eye trauma, the provision of protective measures by the employer and the observance of their implementation by the employee are of great importance for protection.

In our study, it was observed that there was a significant decrease in the rate of applications from individuals aged 16 years and under and above 65 years of age. This decrease could be due to the transition to distance education in the age group of children and the decline in outdoor activities. In the cases of those above 65 years of age, we assume that stricter closure measures implemented for this age group in our country may be effective in this decrease. In addition, in patients aged 65 years and older, the incidence of sight-threatening diseases such as retinal diseases (retinal vascular diseases. age-related macular degeneration, other retinopathies, etc.), iridocyclitis, and glaucoma was significantly higher during the pandemic period than in other age groups. As expected in the older age group, the increase in risk for these diseases with age may explain the higher incidence in this age group.

One of the limitations of our study is its retrospective design. The other limitation is; applications made within the first 10 days by patients who revisit the emergency department are accepted in our country's health system with the same protocol number, but a separate control number is assigned for repeat requests after 10 days. This may have resulted in repetition for some diagnoses in patients who reapplied after 10 days from the first visit. However, due to the large study population, we think that these patients will not affect the overall statistical results. The strongest aspect of our study is that it covers a large number of patients. Our hospital is the only eye-specific public hospital in Ankara and the surrounding provinces. Unlike other centers that were extremely busy due to other branch patients during the Covid 19 pandemic, our hospital served only ophthalmology patients. Due to the above-mentioned reasons, our hospital has become a preferred application center for patients who are referred from other hospitals and have urgent eye complaints. This allowed our study to include a large number of patients. As can be seen from these data, our hospital has taken care to provide health services to all applicants during the pandemic period as a center where outpatient treatment services for ocular emergency patients are successfully carried out.

Conclusion

As a result of this study, it was determined that in the 1st year of the pandemic, applications to the emergency department of a tertiary eye hospital decreased significantly compared to the pre-pandemic period thanks to the protective measures against coronavirus. In the pediatric age group, both before and during the pandemic the most common presentations were thought to be conjunctivitis and foreign bodies in the eye, and it was thought that there was a need to increase awareness among parents and children of protective measures against these.

We are concerned that the decrease in emergency room admissions during the pandemic period may be due to the fact that ocular symptoms and diseases are neglected by patients due to the risk of contracting COVID-19. We think that patients with risk factors and chronic eye diseases should be aware that they should not neglect eye diseases during this period and should pay attention to eye control visits. Ophthalmologists should also take into account that the decrease in emergency department applications during the pandemic period may lead to intensive patient admissions and they may encounter more complicated diseases during the recovery period. Health-care delivery planning should be carried out considering these situations.

Disclosures

Acknowledgments: This study was presented as an oral presentation at Turkish Ophthalmological Association 55th National Congress, October 3–5, 2021, Antalya.

We would like to thank Prof Dr Ozkan Gorgulu for his contributions to the statistical analysis of the study.

Ethics Committee Approval: Approval was obtained from the local ethics committee for the study (Ankara Training and Research Hospital Ethics Committee, number: E-21–647) and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – E.S., M.Y.; Design – E.S., M.Y.; Supervision – E.S., M.Y., K.S.C.; Materials – E.S., M.Y., K.S.C.; Data collection and/or processing – E.S., M.Y., K.S.C.; Analysis and/or interpretation – E.S., M.Y., K.S.C.; Literature search – M.Y.; Writing – E.S., M.Y., K.S.C.; Critical review – E.S., M.Y., K.S.C.

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