



The Impact of COVID-19 Pandemic on Ophthalmology Residency Education

Ali Safa Balci, Cigdem Altan, Muhittin Taskapili

Department of Ophthalmology, University of Health Sciences Beyoglu Eye Training and Research Hospital, İstanbul, Türkiye

Abstract

Objectives: The aim of this study is to investigate the theoretical, practical, and academic effects of the Coronavirus disease 2019 (COVID-19) pandemic on ophthalmology residents.

Methods: The web-based survey consisting of 28 questions was sent through Email to 37 educators who provides resident training. We divided the pandemic period into three, according to the severity of the pandemic and the measures, compared with pre-pandemic period (PreP), separately. Between March 2020 and June 2020 was named as P1, June 2020–October 2020 was named as P2, and October 2020–March 2021 was named as P3.

Results: Responses received from 35 centers (17 university hospitals, 18 training and research state hospitals). There were totally 458 residents in the hospitals. Two hundred and forty-six of them (53.71%) worked on COVID-19 duties, with an average working time of 69.57 days. There were significant decreases in the number of patients examined by resident doctors and theoretical training time in the P1, P2, and P3 periods compared to PreP ($p < 0.05$ for all). Furthermore, in terms of the total number of surgeries in clinics and surgeries performed by residents, there were significant decreases in P1 and P2 compared to PreP ($p < 0.001$ for both), but there was no significant difference in P3 ($p = 0.109$). In the examinations held in the clinic, in the 1st year of the pandemic, the grade average was lower than before the pandemic ($p < 0.05$). Seventeen residents (3.74%) resigned or moved to another hospital.

Conclusion: The COVID-19 pandemic has severely affected the theoretical, practical, and academic training of ophthalmology residents.

Keywords: COVID-19, education, ophthalmology, resident, training

Introduction

In December 2019, there were some reports revealed that the previously unknown virus was causing pneumonia in Wuhan, a city in Eastern China (1). February 11, 2020, the World Health Organization (WHO) declared the official name as “Coronavirus disease 2019 (COVID-19),” shortened version; COVID-19. March 11, 2020, the first COVID-19 case was detected in Türkiye (2) and March 17, 2020, the

first COVID-19-related death occurred (3). At the time of writing this study, there have been 510,270,667 confirmed cases and 6,233,526 deaths worldwide; 15,028,397 cases and 98,751 deaths in Türkiye due to COVID-19 (4).

COVID-19 pandemic has led to global disaster in health systems and also effect educational development of the medical students, residents, and fellowships (5). Health-care staffs, including ophthalmology residents, be charged in filiation and

How to cite this article: Balci AS, Altan C, Taskapili M. The Impact of COVID-19 Pandemic on Ophthalmology Residency Education. *Beyoglu Eye J* 2022; 7(3): 213-222.

Address for correspondence: Ali Safa Balci, MD. Department of Ophthalmology, University of Health Sciences Beyoglu Eye Training and Research Hospital, İstanbul, Türkiye
Phone: +90 539 569 16 70 **E-mail:** alisafabalci@gmail.com

Submitted Date: April 30, 2022 **Accepted Date:** June 06, 2022 **Available Online Date:** August 05, 2022

©Copyright 2022 by Beyoglu Eye Training and Research Hospital - Available online at www.beyoglu-eye.com

OPEN ACCESS This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.



contact tracing units, intensive care units, COVID-19 outpatient clinics, and wards (2). Due to high transmission risk, all elective surgical procedures and outpatient clinical activities were suspended from time to time according to the severity of the pandemic. Face-to-face theoretical lessons were canceled or migrated to online platforms. Furthermore, major international ophthalmology congresses such as American Academy of Ophthalmology (AAO), European Society of Cataract and Refractive Surgery (ESCRS), American Society of Cataract and Refractive Surgery (ASCRS) were canceled and some of them converted virtual. In our country, the 54th National Congress organized by the Turkish Ophthalmology Association was postponed due to the pandemic and was held on the online platform later.

There are some papers about effects of COVID-19 on the ophthalmology residents and specialists. Ferrara et al. (5) distributed an online survey to the ophthalmology trainees and revealed that 76.4% of trainees reported a decrease $\geq 50\%$ of clinical activity and 74.6% of trainees reported a decrease $>75\%$ of surgical activity. Furthermore, dell'Omio et al. (6) reported a 96.2–96.4% decrease in elective surgeries and a 49.7–50.2% decrease in emergency surgeries in the 1st year of the pandemic compared to the pre-pandemic period (PreP).

In this study, we aimed to assess the effects of COVID-19 on ophthalmology residents' theoretical, practical, and academic activities in Türkiye, quantitatively. For this purpose, we created an online survey addressed to educators who administer the academic curriculum and has a teaching role in ophthalmology education clinics.

Methods

This questionnaire study was approved by University of Health Sciences Hamidiye Scientific Research Ethics Committee of the University of, with the decision number 21/584 on November 27, 2021, and the research abides by the principles of the Declaration of Helsinki.

We divided 1st year of pandemic in three different parts cover the time after the onset of the pandemic. The first period comprises the beginning of the pandemic from March 2020 to June 2020 when there was full restriction and elective surgeries were stopped and were named "Pandemic 1" (P1). The second part, called the "new normal," was from June 2020 to October 2020, when restrictions were gradually lifted and elective cases were partially initiated, and was named "Pandemic 2" (P2). The third part was from October 2020, the peak period when cases started to increase again, to March 2021, and was named "Pandemic 3" (P3). We compared these three periods with the past year before the pandemic from March 2019 to March 2020 and was named "Pre-pandemic" (PreP).

An anonymous web-survey was created on Google Forms and sent to 37 educators of the training and research hospitals or universities providing ophthalmology residency training in different regions of Türkiye by email, from December 15, 2021, to January 15, 2022. No personal information was asked, and participants were informed about how the data would be used for this study.

The survey consisted of 28 questions (23 multiple choice questions and five open-ended questions) and four parts. First part, question 1–10, included demographic data about the hospitals and residents (Table 1). Second part, question 10–19, related about alteration of the numbers of the patients examined by residents and the numbers of surgeries at hospital in 1st year of pandemic compared to 1 year before the pandemic (Table 2). Third part, question 16–19, focused on alteration of surgeries performed by residents (Table 2). Fourth part, question 20–27, contained questions about alteration of residents' academic and educational activities (Table 3). Finally, there was an open-ended question about number of residents who resigned or moved to another hospital.

Statistical analysis was done using the SPSS version 26.0 (SPSS Inc. Chicago, IL). The distribution and normality of the data were assessed using the Shapiro–Wilk test. Continuous variables were revealed with means and standard deviation. Continuous variables with normal distribution compared with student's t-test, continuous variables with non-normal distribution compared with Mann–Whitney test. We used paired tests to compare P1, P2, and P3 periods individually with PreP. Data found to be normally distributed were tested using a paired t-test; otherwise, data were compared using a Wilcoxon signed-rank test. Categorical variables assessed using Fisher's exact test or Chi-squared test. We considered $p < 0.05$ as statistically significant.

Results

Demographic Information's

The survey answered by 35 participants (94.56% response rate). Seventeen hospitals (48.6%) were university hospitals and 18 (51.4%) were training and research state hospitals. Twenty-four of the hospitals (68.57%) were from the three largest cities, Istanbul, Ankara, and Izmir. There were 458 residents in 35 hospitals, 234 (51.1%) of them women and 224 (48.9%) of them were men. The average age of residents was 26.85 years. Distribution by the year of the residency, 130 (28.38%) were in the 1st year, 111 (24.23%) were in the 2nd year, 106 (22.92%) were in the 3rd year, and 111 (24.23%) were in the 4th year (Fig. 1).

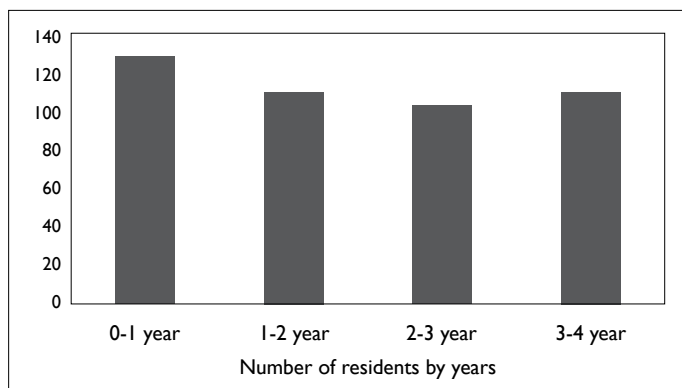
Clinical Practice during the Pandemic

Twenty-six hospitals (74.3%) were announced as pandemic hospital. However, residents from 33 hospitals (94.3%) have

Table 1. Demographic informations about hospitals and residents

	n (%)
1. City?	
2. Which kind of hospital do you work?	
University Hospital:	17 (48.6)
Training and Research State Hospital:	18 (51.4)
3. How many resident doctors are working in your hospital?	458 (n=35)
4. How many women and men exists in resident doctors?	
Women:	234 (51.1)
Men:	224 (48.9)
5. What is the average age of residents?	26.85 years
6. What is the current distribution of residents by year?	
Between 0 and 1. Year:	130 (28.38)
Between 1 and 2. Years:	111 (24.23)
Between 2 and 3. Years:	106 (22.92)
Between 3 and 4. Years:	111 (24.23)
7. Is your hospital announced as pandemic hospital?	
Yes:	26 (74.3)
No:	9 (25.7)
8. Did residents work on COVID-19 wards/outpatient clinic/intensive care unit/filiation unit due to the pandemic?	
Yes:	33 (94.3)
No:	2 (5.7)
9. If they work on COVID-19 duties, between March 2020 and March 2021; how many residents worked in COVID-19 duties? And how much time they spent for these duties? (Average time for 1 resident, as number of days)	
Number of residents:	246 (53.71)
Average Time:	69.57 days

worked on the COVID-19 duties. The total number of residents assigned on the COVID-19 duties was 246 (53.71%) and the average working time of one resident was 69.57 days in a year.

**Figure 1.** Distribution of residents by years.

During PreP, P1, P2, and P3, the average numbers of patients examined per day in the outpatients' clinic by the residents are summarized in Table 2, questions 10–12. There were statistically significant differences between P1 and PreP ($p < 0.001$), P2 and PreP ($p < 0.001$), and P3 and PreP ($p = 0.013$).

The changes in the number of surgeries performed at the hospital and the number of surgeries performed by residents during P1, P2, and P3 compared to PreP are summarized in Tables 2 and 3. In addition, changes of the number of the surgeries performed by the residents are shown in the Figure 2. During PreP, P1, P2, and P3, the average numbers of surgeries performed by residents in a week are summarized in Table 2, question 19. There were statistically significant differences between P1 and PreP ($p < 0.001$) and P2 and PreP ($p < 0.001$), but there was no significant difference between P3 and PreP ($p = 0.109$).

Table 2. The number of patients seen by the residents in the outpatient clinic and the changes in the surgeries performed in the hospital by specialists and residents

10-11-12. How many patients examined by residents in outpatients' clinic during first year of pandemic and one year before the pandemic? (Daily, average number)	PreP	P1	P2	P3		
0-10	0 (0%)	13 (37.1%)	5 (14.3%)	2 (5.7%)		
10-20	1 (2.9%)	14 (40.0%)	7 (20.0%)	5 (14.3%)		
20-30	10 (28.6%)	4 (11.4%)	15 (42.9%)	8 (22.9%)		
30-40	8 (22.9%)	0 (0%)	4 (11.4%)	11 (31.4%)		
40 and over	16 (45.7%)	4 (11.4%)	4 (11.4%)	9 (25.7%)		
13-14-15 18. How did your surgery numbers and number of surgeries performed by residents have changed between March 2020 and June 2020, June 2020 and October 2020, and October 2020 and March 2021 compared to prepandemic period, respectively?	P1 versus PreP		P2 versus PreP		P3 versus PreP	
	Specialists	Residents	Specialists	Residents	Specialists	Residents
Cataract Surgery						
Increased	0 (0%)	0 (0%)	1 (2.9%)	2 (5.7%)	14 (40%)	11 (31.4%)
Decreased	35 (100%)	33 (94.3%)	27 (77.1%)	26 (74.3%)	14 (40%)	15 (42.9%)
No Change	0 (0%)	2 (5.7%)	7 (20%)	7 (20%)	7 (20%)	9 (25.7%)
Refractive Surgery						
Increased	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (11.5%)	3 (13%)
Decreased	20 (80%)	16 (69.6%)	18 (69.2%)	14 (60.9%)	10 (38.5%)	9 (39.1%)
No Change	5 (20%)	7 (30.4%)	8 (30.8%)	9 (39.1%)	13 (50%)	11 (47.8%)
Corneal Surgery						
Increased	0 (0%)	0 (0%)	0 (0%)	1 (3.8%)	6 (18.2%)	6 (20.7%)
Decreased	31 (93.9%)	27 (93.1%)	26 (78.8%)	20 (76.9%)	15 (45.5%)	13 (44.8%)
No Change	2 (6.1%)	2 (6.9%)	7 (21.2%)	5 (19.2%)	12 (36.4%)	10 (34.5%)
Strabismus Surgery						
Increased	0 (0%)	0 (0%)	2 (5.7%)	2 (6.1%)	9 (25.7%)	9 (27.3%)
Decreased	34 (97.1%)	31 (93.6%)	25 (71.4%)	26 (78.8%)	17 (48.6%)	15 (45.5%)
No Change	1 (2.9%)	2 (6.1%)	8 (22.9%)	5 (15.2%)	9 (25.7%)	9 (27.3%)
Elective Vitreoretinal Surgery						
Increased	0 (0%)	0 (0%)	3 (8.6%)	0 (0%)	11 (31.4%)	4 (15.4%)
Decreased	34 (97.1%)	24 (88.9%)	25 (71.4%)	18 (69.2%)	13 (37.1%)	11 (42.3%)
No Change	1 (2.9%)	3 (11.1%)	7 (20%)	8 (30.8%)	11 (31.4%)	11 (42.3%)
Emergent Vitreoretinal Surgery (Endophthalmitis, Retinal Detachment etc.)						
Increased	5 (14.7%)	0 (0%)	5 (14.7%)	0 (0%)	8 (23.5%)	1 (4%)
Decreased	13 (38.2%)	17 (100%)	12 (35.3%)	11 (44%)	6 (17.6%)	8 (32%)
No Change	16 (47.1%)	9 (34.6%)	17 (50%)	14 (56%)	20 (58.8%)	16 (64%)
Glaucoma Surgery						
Increased	1 (3%)	0 (0%)	2 (5.9%)	0 (0%)	13 (38.2%)	4 (13.8%)
Decreased	28 (84.8%)	26 (86.7%)	20 (58.8%)	21 (77.8%)	10 (29.4%)	15 (51.7%)
No Change	4 (12.1%)	4 (13.3%)	12 (35.3%)	6 (22.2%)	11 (32.4%)	10 (34.5%)

Table 2. CONT.

13-14-15 18. How did your surgery numbers and number of surgeries performed by residents have changed between March 2020 and June 2020, June 2020 and October 2020, and October 2020 and March 2021 compared to prepandemic period, respectively?	P1 versus PreP		P2 versus PreP		P3 versus PreP	
	Specialists	Residents	Specialists	Residents	Specialists	Residents
Oculoplastic Surgery (Eyelid Surgery)						
Increased	0 (0%)	0 (0%)	0 (0%)	1 (3%)	9 (25.7%)	8 (24.2%)
Decreased	35 (100%)	31 (93.9%)	26 (74.3%)	25 (75.5%)	16 (45.7%)	16 (48.5%)
No Change	0 (0%)	2 (6.1%)	9 (25.7%)	7 (21.2%)	10 (28.6%)	9 (27.3%)
Oculoplastic Surgery (Nasolacrimal Duct Surgery)						
Increased	0 (0%)	0 (0%)	0 (0%)	2 (6.3%)	9 (26.5%)	8 (25%)
Decreased	34 (97.1%)	30 (93.8%)	25 (73.5%)	25 (78.1%)	17 (50%)	15 (46.9%)
No Change	1 (2.9%)	2 (6.3%)	9 (26.5%)	5 (15.6%)	8 (23.5%)	9 (28.1%)
Emergent Trauma Surgery (Perforation Repair, Eyelid Laceration etc.)						
Increased	5 (14.3%)	2 (6.1%)	5 (14.3%)	3 (9.1%)	12 (34.3%)	7 (21.2%)
Decreased	18 (51.4%)	19 (57.6%)	12 (34.3%)	14 (42.4%)	8 (22.9%)	11 (33.3%)
No Change	12 (34.3%)	12 (36.4%)	18 (51.4%)	16 (48.5%)	15 (42.9%)	15 (45.5%)
19. Before the pandemic and during the pandemic, how many surgeries has been performed by a resident in a week, averagely?	PreP	P1	P2	P3		
0-5	10 (28.6%)	33 (94.3%)	22 (62.9%)	11 (31.4%)		
6-10	12 (34.3%)	2 (5.7%)	11 (31.4%)	17 (48.6%)		
11-20	11 (31.4%)	0 (0%)	2 (5.7%)	5 (14.3%)		
20 and over	2 (5.7%)	0 (0%)	0 (0%)	2 (5.7%)		

Changes in Theoretical Training and Academic Activities

There were theoretical training times for residents in 35 hospitals (100%). Eighteen hospitals (51.4%) conducted at least 50% of their theoretical training on online platforms during the pandemic. Twenty-four hospitals (68.5%) continued face-to-face training and 21 (87.5%) of them made physical changes (seating arrangement, venue changes, etc.) in their clinics due to social distance measures.

The average weekly theoretical training hours during PreP, P1, P2, and P3 are summarized in Table 3, question 23. There were statistically significant differences between P1 and PreP ($p < 0.001$), P2 and PreP ($p < 0.001$), and P3 and PreP ($p = 0.044$).

Regarding the number of academic publications sent by residents throughout the pandemic, seven hospitals (20%) reported increase, 19 hospitals (54.3%) reported decrease, and nine hospitals (25.7%) stated no changes. There was no statistically significant difference among university hospitals and training and research state hospitals ($p = 0.357$). Simi-

larly, there was no significant difference between residents working on pandemic duties and those who continued their ophthalmological practice uninterrupted, in terms of the number of academic publications ($p = 0.202$).

About the congress participations (virtual/physical); after the beginning of the pandemic, in eight hospitals (22.8%) reported increase, 20 hospitals (57.1%) reported decrease, and seven hospitals (20%) stated no changes. There was no statistically significant difference among university hospitals and training and research state hospitals ($p = 0.900$). However, there was a significant difference between residents working on pandemic duties and those who continued their ophthalmological practice uninterrupted ($p = 0.035$).

Thirty hospitals (85.7%) conducted regular examinations for residents. The ranges of examination grade averages are given in Table 3, question 22. When the average examination notes before the pandemic were compared with the notes after the pandemic, there was a statistically significant decrease ($p < 0.001$).

Table 3. Changes in theoretical training and academical activities

20. Is there any theoretical training time for residents in your clinic?				
Yes				35 (100%)
No				0 (0%)
21. During the pandemic, what percentage of your theoretical training times were conducted on online platforms (Zoom, Teams etc.)? (%)				
0–25				10 (28.6%)
25–50				7 (20%)
50–75				3 (8.6%)
75–100				15 (42.9%)
22. In the face-to-face trainings held during the pandemic, were there any physical changes (seating arrangement, venue changes, etc.) made in your clinic due to social distance? (Answer if face-to-face training was done.)				
Yes				21 (60%)
No				3 (8.6%)
23. What was the average weekly theoretical training hour for resident doctors in the pre-pandemic and pandemic period?				
	PreP	PI	P2	P3
0–1	2 (5.7%)	23 (65.7%)	15 (42.9%)	3 (8.6%)
1–2	11 (31.4%)	3 (8.6%)	8 (22.9%)	16 (45.7%)
2–3	17 (48.6%)	9 (25.7%)	10 (28.6%)	12 (34.3%)
3 and over	5 (14.3)	0 (0%)	2 (5.7%)	4 (11.4%)
24. After the onset of the pandemic, how was the number of academic publications/abstracts to the congresses sent by the residents to the journals affected compared to the pre-pandemic period?				
Increased				7 (20%)
Decreased				19 (54.3%)
No change				9 (25.7%)
25. How was the congress participation (virtual/physical) of residents affected after the onset of the pandemic compared to before the pandemic?				
Increased				8 (22.9%)
Decreased				20 (57.1%)
No change				7 (20%)
26. Is there a regularly applied examination system for residents in your clinic?				
Yes				30 (85.7%)
No				5 (14.3%)
27. If there is a regular examination in your clinic, what range is the average of the most recent examinations held before the pandemic and during the pandemic?				
		Before Pandemic		After Pandemic
60–70		4 (11.4%)		5 (14.3%)
70–80		11 (31.4%)		11 (31.4%)
80–90		13 (37.1%)		11 (31.4%)
90–100		2 (5.7%)		3 (8.6%)
28. Are there any residents who have resigned or left your clinic since the beginning of the pandemic? If so, what is this number?				
Yes:				8 (22.9%)
No:				27 (77.1%)
Number:				17 (Total)

A total of 17 residents from eight hospitals resigned or left the hospital. In terms of the number of resigning/leaving residents, there was no significant difference between university hospitals and training and research

state hospitals and between residents working on pandemic duties and those who continued their ophthalmological practice uninterruptedly ($p=0.632$ and $p=0.074$, respectively).

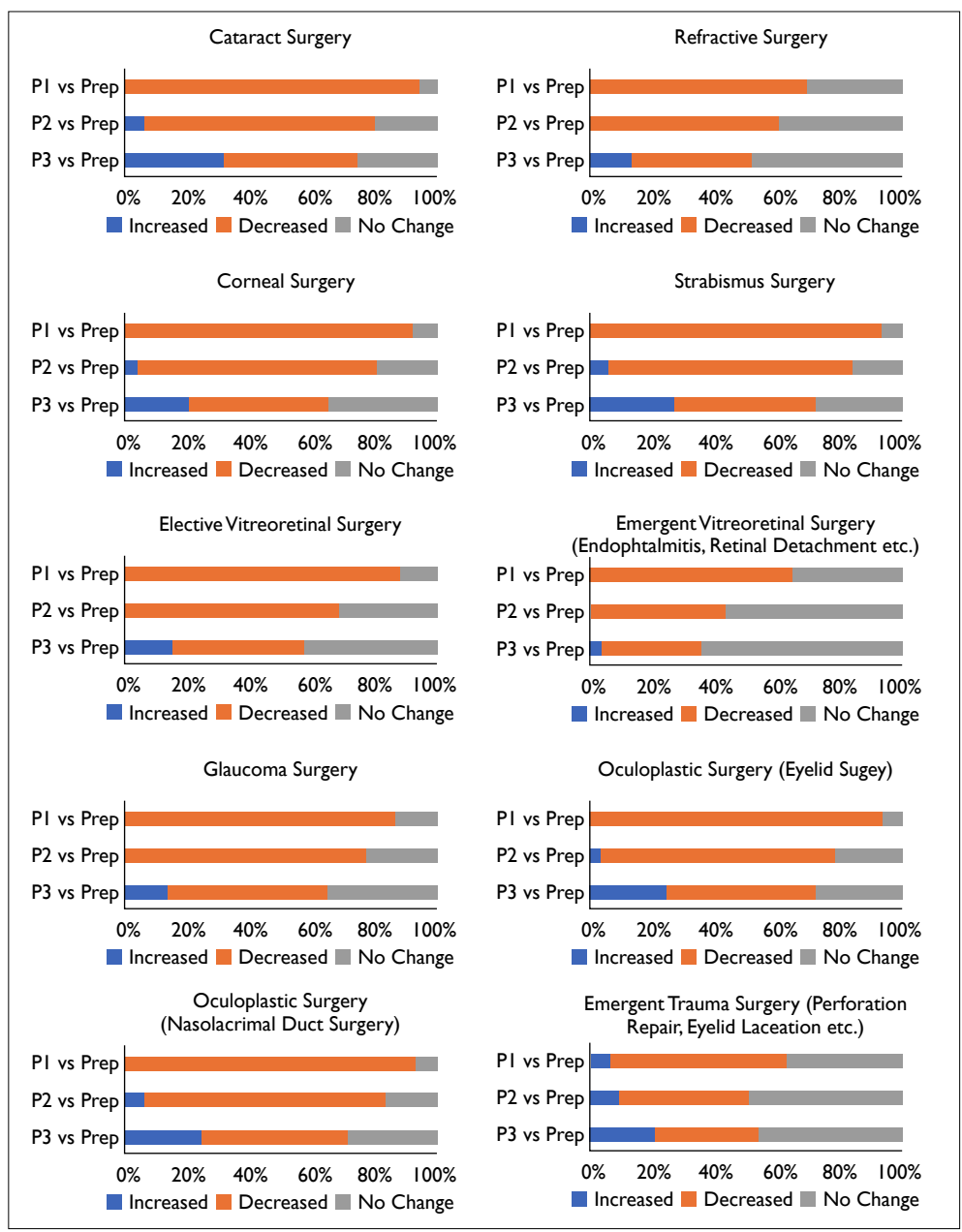


Figure 2. Changes of surgeries performed by residents in P1, P2, and P3 periods compared to PreP.

Discussion

The COVID-19 pandemic has caused many deaths and many devastating effects worldwide. The education of medical students and residents in many branches was also adversely affected by the pandemic (7-9). Ophthalmology residents and specialists are in the risky group for COVID-19 due to the long-term need for close contact with the patient and the risk of contamination from ocular surface (10). In this study, we conducted an online survey to investigate the effects of COVID-19 on ophthalmology residents compared to PreP. To best of our knowledge, there were a few publications about the impact of the COVID-19 pandemic on

ophthalmology residents (5,11,12). Our study is different from other studies in that it questions the types of surgeries performed by residents primarily and compares them numerically with the pre-pandemic. As most of the studies were conducted at the onset of the pandemic, they were insufficient to fully reveal the effects of COVID-19. In addition, most studies have reported results based on residents' feelings and thoughts, which may affect the objectivity of results. Furthermore, sending the questionnaire directly to the educators through Email without sharing it on platforms such as Facebook, Twitter, and Telegram which non-physicians can access, increases the reliability of the answers. In our study, we divided the pandemic into three periods, considering that

the severity of the pandemic and the restrictions applied in our country may also affect education and compared these periods with the PreP. To our current knowledge, this is the first study to measure the impact of the COVID-19 on ophthalmology training over periods and compare it with the pre-pandemic, objectively.

Many doctors, including residents, had to work on the COVID-19 duties. Mishra et al. (12) stated that 176/716 (24.6%) of the residents worked on COVID-19 duties for 21 days lockdown. Another study reported that 27.78% of residents were redeployed due to COVID-19 in the first 2 months of the pandemic (5). In this study, 246 (53.71%) residents worked in the COVID-19 duties in 1 year. The average time spent away from their own clinics is 69.57 days per resident. Due to the increasing number of cases later in the pandemic, the number of residents working on the COVID-19 duties may have increased. Accordingly, these residents are more likely to experience greater disruptions in their ophthalmology training.

Elective surgery and outpatient services were suspended shortly after the onset of the pandemic. Most of the clinics only accepted emergency patients. Therefore, the number of patients examined by the residents decreased. The patient examination is one of the most important parts of medical education. "There is no disease, but there is a the patient" is a striking example that supports this opinion. We found a significant decrease in the average numbers of patients examined per day in the outpatients' clinic by the residents in the P1, P2, and P3 periods compared to PreP ($p < 0.05$ for each). Silva et al. (11) reported that 63% of residents examined patients virtually. Ferrara et al. (5) reported that 34.06% of residents performed virtual clinic/telemedicine. Since there was no telemedicine service in Türkiye at the time of the survey, there was no question about telemedicine in our survey.

In surgical departments, practical training provides the application and reinforcement of theoretical knowledge and best way to learn observational surgical skills. For ophthalmology, cataract surgery is a core competency. The cancellation of elective surgeries caused cataract surgeries not to be performed. Due to El-Saied et al., (13) 90.1% of respondents thought that there was a 50% or greater reduction in elective cases. In another study, the residents' greatest concern was the reduction of cataract surgery (14). Similarly, in our study, cataract surgery performed by residents in P1, P2, and P3 periods was decreased compared to PreP (94.3%, 74.3%, and 42.9%, respectively). Considering the change in the total number of surgeries, in the P1 and P2 periods, there was a significant decrease in the average numbers of surgeries performed by residents in a week compared to the PreP ($p < 0.05$ for both), but there was no

statistically significant difference in the P3 period compared to the PreP ($p = 0.109$). It was similar in strabismus surgery, nasolacrimal duct surgery, etc. (Table 2 and Fig. 2). In the P3 period, there may not have been a significant difference compared to the PreP, due to the increased frequency of pre-operative COVID-19 testing and the initiation of vaccination.

Due to social distance measures, there has been a decrease in face-to-face theoretical training in clinics. While 24 hospitals (68.57%) continued face-to-face training, physical changes (seating arrangement, venue changes, etc.) were made in the training halls in 21 hospitals (87.5%). Eighteen hospitals (51.42%) did at least 50% of their training through virtual platforms. Despite the negative impact of COVID-19 in terms of clinical activity, most ophthalmologists' interest in online learning activities has increased (15). Mishra et al. (16) reported the effect of webinars on the increase in theoretical knowledge as eight out of ten. Ferrara et al. (5) stated that didactic teaching was less affected by the pandemic due to the web-based teaching courses, but residents think that this method cannot replace traditional case reports. In our study, there was a significant decrease in the average weekly theoretical training time in the P1, P2, and P3 periods compared to PreP ($p < 0.05$ for all). Before the pandemic, 22 hospitals (62.85%) provided theoretical training for 2 h or more per week, compared to 9 (25.71%) in P1, 12 (34.28%) in P2, and 16 (45.71%) in P3.

Scientific congresses enable the national or international ophthalmology community to gather and share their updated information. It also helps residents make and develop networks. Due to the risk of contamination and social distance measures, international congresses such as the annual meeting of AAO, 39th Congress of the ESCRS, and annual meeting of ASCRS canceled their face-to-face meetings and moved them to virtual environment. In our country, the 54th National Congress of the Turkish Ophthalmology Association was held in virtual environment. In our study, residents from 20 hospitals (57.1%) were less able to attend congresses than before the pandemic. Moreover, 19 hospitals (54.3%) reported a decrease in the number of academic publications and abstracts sent to congresses by their residents.

The most objective evaluation of education is the examinations. In our study, 30 hospitals had annual examinations for residents. There was a statistically significant decrease between the average of the last examination before the pandemic and the average of the first examination in the pandemic ($p < 0.001$). This is the most striking example of the negative impact of the pandemic on resident training.

The pandemic also negatively affected the mental state of doctors. In one study from Türkiye, it was reported that

91% of ophthalmologists work with high anxiety (17). Szi-giato et al. (18) reported that 71% of residents had more anxiety than before the pandemic. In order not to affect the objectivity of the answers, there was no direct question about emotional state changes in our questionnaire. Instead, we asked the number of residents who resigned, because the decision to resign is the result of negative feelings and thoughts (19). In this study, eight hospitals (22.8%) reported that there were residents who resigned or moved to another hospital from their clinics. The total number of residents who resigned or moved to another hospital was 17 (3.74%). It was forbidden in our country to resign between March 20, and June 2, 2020 and October 27, 2020, and July 1, 2021 by Ministry of Health. During the 1-year period covered by our study, residents had the right to resign for only 5 months. Due to this prohibition, the number of resignations may have been lower than they would normally have been.

Our study has the inherent obstacles of survey-based studies. These results are only for residents working in Türkiye. Furthermore, there was no question about simulation-based devices that have a place in surgical training. Apart from the limitations, we think that there are some strengths of our study. Questioning the 1-year effects of the pandemic and comparing it with the PreP, directing questions to educators so that they are not affected by emotions and are objective, questioning the surgical, clinical, and academic activities of the residents are some of them.

Conclusion

The COVID-19 pandemic has seriously affected the training of ophthalmology residents. More than half of the residents worked in COVID-19 duties and were away from their own clinics for an average of 2 months in 1 year. Although the number of surgeries performed has not yet approached the PreP, this gap may be gradually closing with pre-operative testing, vaccination and precautions. To compensate for the negativities caused by the pandemic, national and international associations can organize compensation programs such as simulation-based trainings and virtual lessons. The gradual lifting of restrictions in many countries offers hope for a return to normalcy.

Disclosures

Ethics Committee Approval: University of Health Sciences Hamidiye Scientific Research Ethics Committee, 21/584, 12.11.2021

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – A.S.B., M.T., C.A.; Design – A.S.B., M.T., C.A.; Supervision – A.S.B., M.T., C.A.; Resource – M.T., C.A.; Data collection and/or processing – A.S.B., C.A., M.T.; Analysis and/or interpretation – A.S.B., C.A.; Literature search – A.S.B.; Writing – A.S.B., C.A.; Critical review – C.A., M.T.

References

- Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382:727–33. [CrossRef]
- Barlas G, Ozturk H, Pehlivanurk G, Aydin S. Turkey's response to COVID-19 pandemic: Strategy and key actions. *Turk J Med Sci* 2021;51:3150–6. [CrossRef]
- Demirbilek Y, Pehlivanurk G, Ozguler ZO, Alp Mese E. COVID-19 outbreak control, example of ministry of health of Turkey. *Turk J Med Sci* 2020;50:489–94. [CrossRef]
- World Health Organization. WHO COVID-19 Dashboard. Geneva: World Health Organization, 2020. Available from: <https://www.covid19.who.int>. Accessed July 7, 2022.
- Ferrara M, Romano V, Steel DH, Gupta R, Iovino C, Van Dijk EH, et al. Reshaping ophthalmology training after COVID-19 pandemic. *Eye (Lond)* 2020;34:2089–97. [CrossRef]
- Dell'omo R, Filippelli M, Virgili G, Bandello F, Querques G, Lanzetta P, et al. Effect of COVID-19-related lockdown on ophthalmic practice in Italy: A report from 39 institutional centers. *Eur J Ophthalmol* 2022;32:695–703. [CrossRef]
- Al Samaraee A. The impact of the COVID-19 pandemic on medical education. *Br J Hosp Med (Lond)* 2020;81:1–4. [CrossRef]
- Aziz H, James T, Remulla D, Sher L, Genyk Y, Sullivan ME, et al. Effect of COVID-19 on surgical training across the United States: A national survey of general surgery residents. *J Surg Educ* 2021;78:431–9. [CrossRef]
- Li YM, Galimberti F, Abrouk M, Kirsner RS. US dermatology resident responses about the COVID-19 pandemic: Results from a nationwide survey. *South Med J* 2020;113:462–5. [CrossRef]
- Karslioglu MZ, Ozturkmen C, Kesim C, Tas AY, Karadeniz PG, Sahin A. Survey of the impact of the COVID-19 pandemic on ophthalmology clinical practice in Turkey. *Turk J Ophthalmol* 2021;51:269–81. [CrossRef]
- Silva N, Laiginhas R, Meireles A, Breda JB. Impact of the COVID-19 pandemic on ophthalmology residency training in Portugal. *Acta Med Port* 2020;33:640–8. [CrossRef]
- Mishra D, Nair AG, Gandhi RA, Gogate PJ, Mathur S, Bhushan P, et al. The impact of COVID-19 related lockdown on ophthalmology training programs in India outcomes of a survey. *Indian J Ophthalmol* 2020;68:999–1004. [CrossRef]
- El-Saied HM, Abdelhakim MA. Impact of COVID-19 pandemic on young ophthalmologists in Cairo University hospitals. *Semin Ophthalmol* 2020;35:296–306. [CrossRef]
- Hussain R, Singh B, Shah N, Jain S. Impact of COVID-19 on ophthalmic specialist training in the United Kingdom-the trainees perspective. *Eye (Lond)* 2020;34:2157–60. [CrossRef]
- Parke DW 2nd. COVID-19 era impacts on the American academy of ophthalmology. *Ophthalmology* 2020;127:1447–50.
- Mishra D, Nair AG, Verma L, Grover AK, Mathur S, Srivastav T. The perceived impact of webinars during the COVID-19 pan-

- demic: A survey of ophthalmology trainees from India. *Oman J Ophthalmol* 2021;14:78–84. [\[CrossRef\]](#)
17. Kavadarli I, Mutlu M. Effects of the COVID-19 pandemic on Turkish ophthalmologists. *Turk J Ophthalmol* 2021;51:95–101.
18. Sziगत AA, Palakkamanil M, Aubin MJ, Ziai S. Canadian ophthalmology resident experience during the COVID-19 pandemic. *Can J Ophthalmol* 2021;56:e42–4. [\[CrossRef\]](#)
19. Saijo Y, Yoshioka E, Hanley SJ, Kitaoka K, Yoshida T. Job stress factors affect workplace resignation and burnout among Japanese rural physicians. *Tohoku J Exp Med* 2018;245:167–77.