

THE EFFECT OF COVID-19 PANDEMIC ON OPHTHALMOLOGY RESIDENCY TRAINING (STUDY ON AIRLANGGA UNIVERSITY, SURABAYA, INDONESIA)

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Introduction

Since March 11, 2020, the World Health Organization (WHO) declared the 2019 Corona Virus (COVID-19) a pandemic, subsequently many countries had implemented various restrictions, including physical distancing and lockdowns to prevent the virus from spreading faster. The COVID-19 pandemic is causing a crisis in health systems worldwide, and among these include the influence on residency training of various specialities. The Central Disease Center (CDC) also recommends that all actions involving the assemblage of more than five people must be avoided. This regulation is disrupting many pillars of residency education. Clinical education and surgical skills also decreased, because of the decrease in the number of patient and recommendations for elective surgery restriction, limitation of the number of participants in the operating room and clinical settings. Didactic and academic lectures were disrupted due to recommendations for discontinuing bedside teaching, morning and evening reports, grand round, and seminars. Residents who need to do research will be hampered because of reduced employees' number in essential parts of the research facility. Postponement of final examinations will result in longer education time. In addition, there was a reduction in the number of residents because of the deployment to COVID ward [1].

Ophthalmology is a branch of surgery that requires very fine motor skills and hand-eye coordination. To achieve these skills, ophthalmology residents need a certain amount of practice. Before the pandemic, the resident achieved this skill by performing and assisting surgery for at least ten hours per week and attended lectures four hours per week. The pandemic that has been going on for almost a year has dramatically reduced these learning patterns [2]. India reported that 80.7% of ophthalmology residents felt that the COVID-19 pandemic had a negative impact on their education. This, among others, is caused by the significantly reduced exposure to surgery and outpatient visits [3]. Alahmadi's research in Saudi Arabia stated that 88.3% of ophthalmology residents experienced a reduction in patient exposure and the amount of working hours in the hospital [4].

During the pandemic, ophthalmology residents undertook alternative didactic lectures using online media. This is considered quite satisfying because

there is an increase in webinars, quizzes and other education through various application such as Zoom, Twitter, and Youtube. In addition, periodic conferences and scientific meetings are also conducted online and allow residents to attend the conference without worrying about transportation and accommodation costs. 81.2% of ophthalmology residents in India are satisfied with online didactic lectures³, whereas 55.4% of ophthalmology residents in Saudi Arabia were satisfied with the virtual lecture method⁴.

The impact of the COVID-19 pandemic on the education of ophthalmology residents, especially in a developed country, is limitedly studied. Therefore, the current study was aim to study the impact of COVID-19 pandemic on ophthalmology resident in Airlangga University, Surabaya, Indonesia with the hope that the resident's perspective can be used to help the ophthalmology education system adapt to changes during the pandemic.

Materials and methods

This research is a descriptive observational study. An anonymous online survey with a Google form link was distributed online to all ophthalmology resident of Airlangga University. All the resident voluntarily participate and paper-based consent form are also used before the residents fill out the survey. No personal data was collected other than sex and residents' academic level. The exclusion criteria in this study are the residents that refused to participate and on educational leave. Link to the survey was given at February 17th 2021 and replies were collected by February 21st 2021.

The survey consist of 17 questions that grouped into 4 section. The first section are general demographic data which consist of sex, and resident's academic level. The second section are focused on impact of covid-19 pandemic on clinical training which consist of questions about changes in the number of patients after the pandemic. The third section are focused on resident's feedback on online learning, and the fourth section are focused on changes in learning patterns and clinical research after the pandemic. In the final question, residents are asked about the pandemic's general impact in their residency program. The complete survey are shown on appendix 1. Ethical approval was obtained from the ethical committee of health research at Dr Soetomo General Hospital, the teaching hospital where the resident of Airlangga university studied.

Resident then divided into three group based on their academic level to asses which stage are the most impacted by the pandemic. First stage was the junior resident that are on the 2-4th semester of their residency, the second stage was the intermediate resident that are on the 5-6th semester, and the third stage was the senior resident that are on the ≥ 7 th semester. Descriptive analysis of the survey was performed using SPSS version 23 (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY, USA). The correlation between the magnitude of the pandemic impact and the level of the

resident was evaluated using Spearman's correlation analysis with the same software.

Result & discussion

Demographic data

Out of 72 residents, 69 residents met the inclusion criteria and participated in this study. There were 27 male residents (39.1%) and 42 female residents (60.9%). Resident's academic level consist of 21 (30,4%) junior resident, 21 (30,4%) intermediate resident and 27 (39.1%) senior residents.

Effect on COVID-19 Pandemic on Clinical Training

The effect of the COVID-19 pandemic on ophthalmology residents' clinical training was assessed by the Changes in residents' clinical and surgical activities, including the number of hours worked at the hospital and patient volume changes in various component of the hospital. Before the pandemic, most ophthalmology residents work 50-80 hours per week, depending on their speciality rotation. In this study, the results showed that the number of working hours in the hospital's ophthalmic residents had decreased since the pandemic occurred. A total of 19 residents found that their working hours decreased significantly by $\geq 50\%$ (27.5%), and the remaining 50(72.5%) residents had minor decrease in working hours. The number of patients treated by ophthalmology residents has decreased since the pandemic began. The elective surgery performed was significantly reduced in 65.2% (45) of residents, 34.8% (24 residents) had a mild reduction. The office-based procedure was significantly reduced in 68.1% (47) residents, 26.1% (18 residents) experienced a mild reduction, and 5.8% (47 residents) had an equal number of patients treated as before the pandemic. Laser

treatment performed in an outpatient clinic setting were significantly reduced in 58.8% (40) residents, 33.8% (23) residents felt mild reduction, and 7.4% (5 residents) had equal number of patients as before the pandemic. The number of outpatient visits decreased significantly by 27.5% (19 residents), 68.1% (47) residents experienced a mild reduction, and 4.3% (3 residents) had the same amount of patients as before the pandemic. 8.7% (6) of residents experienced a significant reduction in emergencies case, 55.1% (38) of residents experienced a mild reduction, 34.8% (24 residents) had an equal number of emergency case, and one resident (1.4%) had an increased number of emergency patients.

The resident was also asked about the pandemic's effect on minimum case log set by the Indonesian College of Ophthalmologist (ICO). The full case log requirement will described in detail on appendix 2. Resident must meet the minimum requirement of various case and procedures during the entirety of their residency experience and considered competent if they meet competency standards set by the ICO. Failure to meet the minimum target will cause graduation to be delayed. In this study, it was found that almost all Ophthalmology residents felt the COVID-19 pandemic had a negative effect on the number of the case log minimal requirement, 10.1% (7 residents) can only meet a quarter of ICO's case log targets since the pandemic occurred, 42% (29 residents) can meet 25-49% of ICO 's case log targets and 40.6% (28 residents) can meet 50-75% of ICO 's case log targets. Only 7.2% (5 residents) can meet the full requirement of the ICO case log target. No residents can exceed the ICO's target since the pandemic occurred. The effect and changes in resident surgical and clinical activity are shown on table 2.

Table 2. The effect and changes in resident surgical and clinical activity

Patient at	Significantly reduced	Mildly reduced	Same as before the pandemic	Increased
Elective surgery	65.2%	34.8%	0%	0%
In-office procedure	68,1%	26.1%	5.8%	0%
Ophthalmic laser treatment	58.8%	33.8%	7.4%	0%
In-patient visits	68.1%	27.5%	0%	0%
Emergency cases	8.7%	55.1%	34.8%	1.4%

Residents' feedback on online learning

Airlangga University switched traditional didactic to online since April 2020. 88.4% (61 residents) of ophthalmology choose home as the most comfortable place to study online. Other places chosen were public places with internet facilities, hospitals and friends' houses. The most frequently used applications were

zoom at 69.4% (68 residents) and Youtube at 27.6% (27 residents). Other applications used are Google Meet at 1% (1 resident) and Google Hangout by 2% (2 residents). As many as 52.2% (36 residents) are satisfied with the online learning method and 85.5% of residents (59 residents) agree to continue online learning after the pandemic is over. The Residents feedback on online learning are shown on table 3.

Table 3. Resident's feedback on online learning

		n	%
Most comfortable place to do online learning*	Home	61	88.4
	Public facility with internet connection	4	5.8
	Hospital	3	4.3
	Friend's/relatives' house	1	1.4
Application for online learning*	Zoom	68	69.4
	Youtube	27	27.6
	Google hangout	2	2.0
	Google meet	1	1.0
Level of satisfaction	1 Very dissatisfied	1	1.4
	2 Not satisfied	2	2.9
	3 Neutral	27	39.1
	4 Satisfied	36	52.2
	5 Very satisfied	3	4.3
When the pandemic is over, do you think web-based learning should be continued?	Yes	59	85.5
	No	10	14.5

*Resident can choose more than one answers

Changes in resident learning patterns after the pandemic

Since the pandemic, there has been a reduction in working hours in hospitals, resulting in changes in learning patterns to suit existing regulations. According to the results of this study, 44.9% (31 residents) experienced an increase in study hours after the pandemic, while the time for doing scientific assignments was the same as before the pandemic (27 residents; 39.1%). Although the amount of time of carrying out scientific assignments was the same as before the pandemic, the residents felt that there were obstacles in carrying out tasks due to lack of motivation from being at home too often and being distracted by household chores (59.4%, 38 residents). 40.4% (33 residents) also experienced difficulties in appointment to consult with

their supervisor because the new regulation not allowing personnel between shifts to meet. The residents sometimes couldn't meet with their supervisor because one of them were exposed to COVID patient while on duty hence requiring isolation. Other obstacles felt by the residents were scientific support facilities such as laboratories were closed due to the pandemic lockdown and there was reduction in the number of officers due to the new shift system. Those obstacles mentioned above were considered significant so that 85.7% (58) of the residents were experiencing delay in completing their scientific assignments with the majority of a delay of 3-6 months. The distribution of changes in learning patterns after the pandemic will be further explained in table 4

Table 4. Changes in resident learning patterns after the pandemic

		n	%
Amount of study hours during pandemic	Significantly reduced	1	1.4%
	Mildly reduced	7	10.1%
	Same as before the pandemic	24	34.8%
	Increased	31	44.9%
	Significantly increased	6	8.7%
Amount of time of carrying out scientific assignments	Significantly reduced	0	0%
	Mildly reduced	9	13.0%
	Same as before the pandemic	27	39.1%
	Increased	6	8.7%
	Significantly increased	0	0%
Obstacle to carry out scientific assignments	Mild	20	29.4%
	Moderate	24	35.3%
	Huge	14	20.6%
	No obstacles	10	14.7%
Obstacles*	Lack of motivation for being at home too often	38	59.4%
	Difficulties to consult with their supervisor	33	40.4%

	Research facilities lockdown	21	32.8%
	Reduction in the number of personnel in research facilities	19	29.7%
	Others	1	1.6%

*Resident can choose more than one answers

Effect of COVID-19 Pandemic on overall residency training

There were 50.7% (35 residents) who think that the COVID-19 pandemic would cause their graduation to be delayed by 1-3 months, 26.1% (18 residents) think that the COVID-19 pandemic would cause their graduation to be delayed by 4-6 semesters, 14% (10 resident) think that the effects of the COVID-19 pandemic on his education were very heavy so that it

would cause his graduation to be delayed indefinitely. Only 5.8% (4 residents) think that the COVID-19 pandemic would not affect the length of their education and the remaining 2.9% (2 residents) think that the new regulations that occurred due to the COVID-19 pandemic would accelerate their training period. The percentage of the effects of the COVID-19 pandemic will be explained with a pie chart in figure 1.

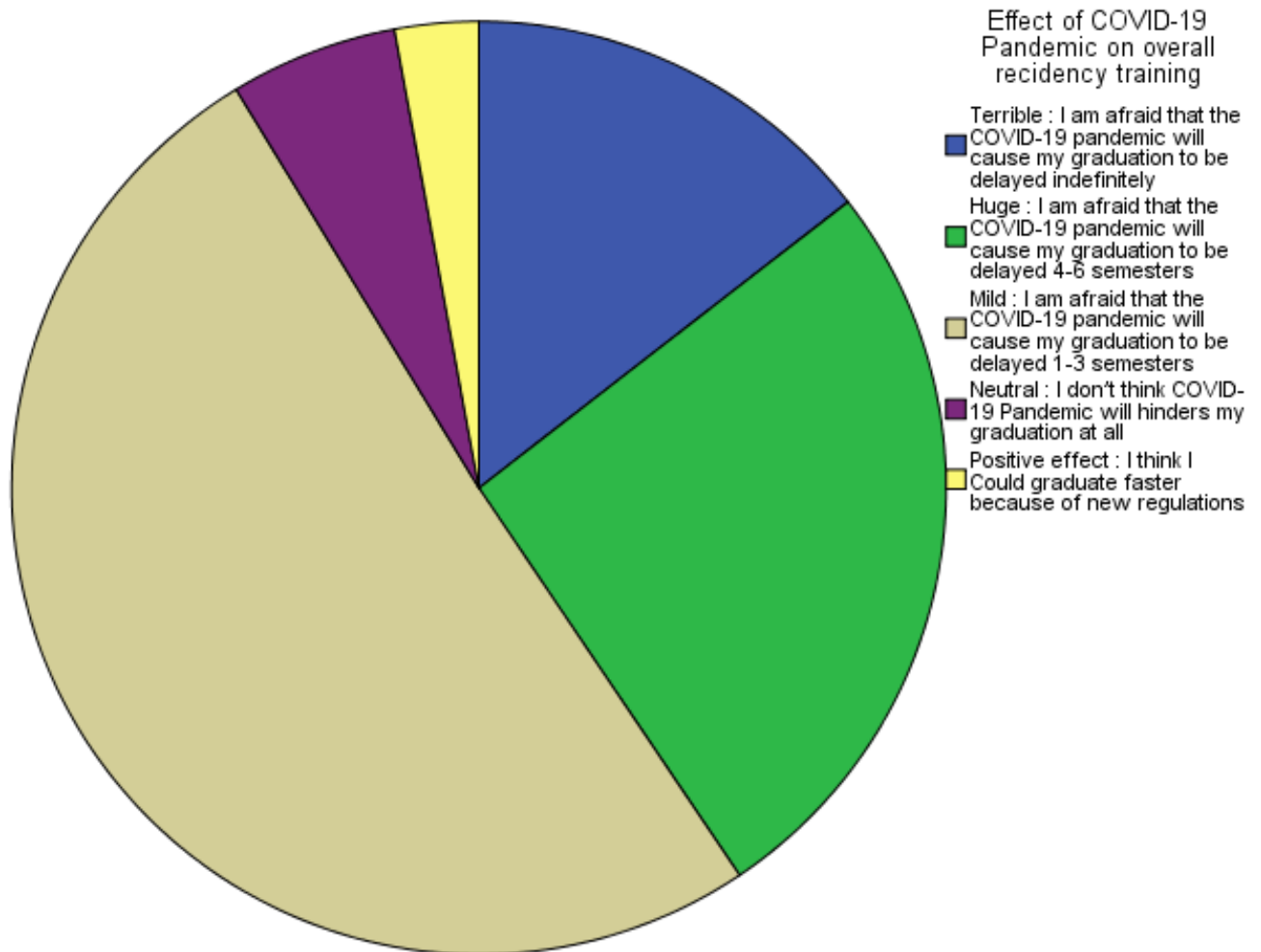


Figure 1. the effects of the COVID-19 pandemic on overall residency training

Spearman's correlation analysis showed that is a negative correlation between the residents' academic level and the effects of the COVID-19 pandemic on overall residency

training and the negative effects of the Covid-19 pandemic were greater among senior residents ($p = 0.002$, $P < 0.01$). Spearman's correlation analysis table was showed on table 5.

Table 5. Correlation between the residents' academic level and the effects of the COVID-19 pandemic on overall residency training

			Residents' academic level	Effect of covid-19 pandemic on overall residency training
Spearman's rho	Residents' academic level	Correlation Coefficient	1.000	-.374**
		Sig. (2-tailed)	.	.002
		N	69	69
	Effect of covid-19 pandemic on overall residency training	Correlation Coefficient	-.374**	1.000
		Sig. (2-tailed)	.002	.
		N	69	69

** . Correlation is significant at the 0.01 level (2-tailed).

The effect of the COVID-19 pandemic on the clinical skills of residents of Ophthalmology, in Airlangga University was assessed by the Changes in residents' clinical and surgical activities, including the number of hours worked at the hospital and patient volume changes after the pandemic. The majority of residents experienced a decrease working by half. This occurs because of hospital regulations that regulate personnel restrictions at the hospital, resulting in reduced working hours. This reduction in the number of working hours of the resident is also consistent with research conducted on ophthalmology residents in Portugal [6] and the South Korean orthopedic resident in South Korea. The significant reduction in working hours occurred due to delays in elective surgery, limitation of outpatient visits, assignment of orthopaedic residents to work in the COVID-19 ward and the need for self-isolation and quarantine due to exposure to COVID-19 patients while on duty [5].

The reduction in the number of patients is a huge challenge for resident teaching and training in ophthalmology because most ophthalmic cases need a slit lamp in their examination and this is difficult to conduct virtually [7]. The majority of Ophthalmology residents have experienced a decline in patients' number since the COVID-19 pandemic occurred. Based on the most answers, data shows a significant reduction in elective surgery, office-based procedure, lasers, and outpatient visit. Meanwhile, a mild reduction was felt in emergency cases. This reduction has a significant effect on ophthalmology residents. More than ¾ of the residents had difficulty meeting the ICO's targets since the pandemic happens. The difficulty in fulfilling this competency target also occurs in residency education from various study programs worldwide. The American Board of Orthopedic Surgery (ABOS) provides opportunities to find patients outside the usual teaching hospital so that orthopedic residents can meet the ACGME competency targets [16]. Radiology and ENT study programs also experienced a decrease in competency targets and the local commission recommended additional didactic lectures and collaborated with local clinical competence committees to find additional patients outside the teaching hospitals

[8,1]. In Indonesia, ICO decided to lower the standard of test requirements for board exam because of a decreased number of the patient since the pandemic. Previously, residents are allowed to take the board exam if they had already done a minimum of 40 cataract surgery, after pandemic residents can take the board exam without these conditions, but the decision of graduation are returned to their respective education centre.

The ophthalmology department of Airlangga University has implemented an online learning path since April 2020. Most residents choose home as the most comfortable place to study online. Other places chosen are public places with internet facilities, hospitals and friends' houses because they have good internet speeds and less distraction. The types of online learning vary from didactic lectures such as webinars, group discussions such as weekly reports, virtual surgery and online exams. All types of learning are facilitated and scheduled by department so that residents can participate in all types of learning comfortably. More than half of the residents are satisfied with the online learning method and agree that online learning should continue after the pandemic is over. This result is in line with research by Alahmadi conducted on Saudi Arabian Ophthalmology residents, where more than of residents were satisfied with the online learning method [4]. Online learning is also carried out not only for residents but for medical students, where 82% of medical students are also satisfied with online learning [9]. Dissatisfaction with online learning methods occurred among orthopaedic residents in South Korea because residents felt that online teaching methods were difficult to replace traditional teaching methods, especially in terms of clinical skills [5]. The most frequently used applications to doing online learning were Zoom and Youtube. The Zoom application is the main application used at ophthalmology department of Airlangga University to carry out online learning activities. The Zoom application is also the most popular choice in Saudi Arabia eye residents [4]. Another application that is favored by ophthalmology residents of Airlangga University is Youtube, which used to watch lecture recordings. In the ophthalmology, Youtube is also recommended as a virtual learning method because there are many operation

videos from various cases that can be used as material for resident discussions with the attendings [10]. Other applications that are often used are Google meet and Google hangout, which residents use to replace study group

Ophthalmology residents of Airlangga University were also assigned to make scientific assignments of journal reading, writing literature reviews, case reports, and research submitted for publication. The time allocation spent on scientific assignments are the same as before the pandemic, although the time allocated should be higher because of reduced working hours and more frequent stays at home. This happened because the residents felt distracted by household chores and lacked motivation from being at home too often. The same thing was felt by surgical oncology residents in Germany, where the main problem they have faced since the pandemic occurred is a lack of motivation [11]. This of course needs to be watched out for because lack of motivation is one of the symptoms of burn out. Symptoms of burn out have been reported to have increased since the pandemic began and have been studied to have a negative effect on French pediatric residents [12]. Resident from various specializations in Romania also reported an increase in symptoms of burn out by more than 75% [13]. Further research is needed to determine the mental status of ophthalmology residents after the pandemic.

Another obstacle that residents felt in carrying out scientific assignments was the difficulty in consulting with attendings regarding regulatory changes after the COVID-19 pandemic, such as unequal work from home schedules and shift systems that did not allow personnel between shifts meet. Resident and attendings are sometimes unable to meet because they are exposed to COVID-19 patient, thus requiring isolation. Other obstacles that residents also felt were research support facilities being closed due to the pandemic lockdown. Research obstacles due to pandemics have also been reported worldwide and some of them even hampers student graduation [14,15]. Research in Japan also reports that the COVID-19 pandemic has a negative effect on research facilities and the motivation of researchers¹⁶. The obstacles mentioned above are considered significant so that 85.7% of residents experience a delay of 3-6 months in completing their scientific assignment. Although this is slightly different from Silva's research on ophthalmology residents in Portugal, which states that local residents have more time to complete scientific assignments, and there has been an increase in research publications since the pandemic occurred [16].

To complete their education, ophthalmology residents need to meet two requirements which are case log standards set by ICO and scientific assignments set by Airlangga University. Failure to complete one of these

components would result in a delay in completing the regular resident's education period of eight semesters. 91.8% of the residents felt that COVID-19 pandemic would hamper their graduation, and the higher the resident level, the greater the concern about the obstacles that would occur due to the COVID-19 pandemic. This concern occurs because senior residents are currently doing research so ,the closure of research facilities will prolong the time to completing the task. Before the pandemic, senior resident would deployed to smaller hospital. This allowed senior residents to gain much faster competence because of high volume patient in smaller hospital. After pandemic this smaller hospital rotation was abolished due to faculty and local government regulations that restricting residents' movement between cities to prevent further spreading of COVID-19.

Conclusion

The COVID-19 pandemic has a negative effect on ophthalmology residents' education. The decreased number of patients made it difficult for the residents to meet competency standards. The new regulations related to COVID-19 also cause obstacles to completing scientific assignments and have the potential to delay graduation of ophthalmology residents.

Appendix 1

The Effect of COVID-19 Pandemic on Ophthalmology Residency Training

Information and consent:

Greetings of the day, residents, this survey takes 5 minutes to complete, your participation is crucial in providing an overview of the current condition of your residency and we hope this survey can help improve the educational situation in the future pandemic.

Do you agree to participate in this survey? We will keep your data confidential and will only be used for research purposes

- Yes
- No

Demographic Data:

1. What academic level are you at now?

- Junior
- Intermediate
- Senior

2. What is your gender?

- male
- Female

The Effect of COVID-19 Pandemic on clinical training

3. During the pandemic the number of hours you work in the hospital (compared to

- normal work hours before pandemic which is 50-80 hours/month)?**
- Significantly reduced (total work hours at the hospital reduced $\geq 50\%$)
 - Mildly reduced (total work hours at the hospital reduced $< 50\%$)
 - The amount of work hours is the same as before the pandemic
 - Increase (total work hours at the hospital increased)
- 4. During the pandemic the amount of elective surgery (for example : cataract surgery, intravitreal injection, strabismus surgery, etc) that you performed/assisting?**
- Significantly reduced (total amount of elective surgery reduced $\geq 50\%$)
 - Mildly reduced (total amount of elective surgery reduced $< 50\%$)
 - The amount of elective surgery before the pandemic
 - Increase (total amount of elective surgery increased)
- 5. During the pandemic the amount of in-office procedure (for example: suture removal, hordeolum incision) that you performed/assisting?**
- Significantly reduced (total amount of in-office procedure reduced $\geq 50\%$)
 - Mildly reduced (total amount of in-office procedure reduced $< 50\%$)
 - The amount of in-office procedure before the pandemic
 - Increase (total amount of in-office procedure increased)
- 6. During the pandemic the amount of ophtalmic laser treatment (for example: Pan retinal photocoagulation, YAG-laser capsulotomy, etc) that you performed/assisting?**
- Significantly reduced (total amount of ophtalmic laser treatment reduced $\geq 50\%$)
 - Mildly reduced (total amount of ophtalmic laser treatment reduced $< 50\%$)
 - The amount of ophtalmic laser treatment before the pandemic
 - Increase (total amount of ophtalmic laser treatment increased)
- 7. During the pandemic the amount of inpatient visits?**
- Significantly reduced (total amount of inpatient visits reduced $\geq 50\%$)
 - Mildly reduced (total amount of inpatient visits reduced $< 50\%$)
 - The amount of inpatient visits are the same as before the pandemic
 - Increase (total amount of inpatient visits increased)
- 8. During the pandemic the amount of emergency ophtalmic cases and emergency ophtalmic consultation ?**
- Significantly reduced (total amount of emergency cases reduced $\geq 50\%$)
 - Mildly reduced (total amount of emergency cases reduced $< 50\%$)
 - The amount of emergency cases are the same as before the pandemic
 - Increase (total amount of emergency cases increased)
- 9. On a scale of 1-5, In the speciality that you are currently rotated on, how extensive is the effect of Covid 19 pandemic on the number of your ICO case log?**
- 1 Very poor : I only achieve less than 25% of ICO case log target
 - 2 Poor: I only achieve less than 25-49% of ICO case log target
 - 3 Inadequate : I only achieve less than 50-75% of ICO case log target
 - 4 Adequate : I can achieve 75-100% of ICO case log target
 - 5 Abundant : My ICO case log target are already more than enough
- WEB-BASED TEACHING DURING PANDEMIC**
- 10. Where are you usually most comfortable doing online learning?**
- Hospital
 - Home
 - Friend's house
 - Public facility with internet connection (such as : caf , library)
 - others
- 11. What application do you like the most for online learning?**
- Zoom
 - Microsoft teams
 - Youtube
 - Google hangouts
 - Others
- 12. On a scale of 1-5 (1 very dissatisfied and 5 very satisfied) what is your level of satisfaction with the online learning provided?**
- 1 very dissatisfied
 - 2 Not satisfied
 - 3 Neutral
 - 4 Satisfied
 - 5 Very satisfied

13. When the pandemic is over, do you think web-based learning should be continued?

- Yes
- No

Changes in resident learning patterns after the pandemic

14. On scale of 1-5, During pandemic, your study hours at home:

- 1. Significantly reduced
- 2. Mildly reduced
- 3. Same as before the pandemic
- 4. Increased
- 5. Significantly Increased

15. On scale of 1-5, During pandemic, the amount of time of carrying out scientific assignments:

- 1. Significantly reduced
- 2. Mildly reduced
- 3. Same as before the pandemic
- 4. Increased
- 5. Significantly Increased

16. After pandemic, on a scale of 1-5, how significant are the obstacle to carry out scientific assignments ?

- Terrible : Too many obstacles and I cant do the assignment at all
- Huge : The obstacles make my submission of scientific assignments got delayed 6-12 months
- Moderate : The obstacles make my submission of scientific assignments got delayed 3-6 months
- Mild : The obstacles make my submission of scientific assignments got delayed 1-3 months

- Positive impact: No obstacles, completion scientific assignments goes faster than before the pandemic

17. What obstacles did you experienced?

- Lack of motivation for being at home too often
- Difficulties in appointment to consult with their supervisor
- Research facilities lockdown
- Reduction in the number of personnel in research facilities
- Others

Effect of COVID-19 Pandemic on overall recidency training:

18. On scale of 1-5 how much effect the COVID-19 pandemic on your education? (compared to normal training time of 8 semesters)

- 1 : Terrible → I am afraid that the COVID-19 pandemic will cause my graduation to be delayed indefinitely
- 2 : huge → I am afraid that the COVID-19 pandemic will cause my graduation to be delayed 4-6 semesters
- 3, Mild → I am afraid that the COVID-19 pandemic will cause my graduation to be delayed 1-3 semesters
- 4. Neutral → I don't think COVID-19 Pandemic will hinders my graduation at all
- 5. Positive effect → Changes in regulations due to the COVID-19 pandemic made me feel confident that I could graduate faster

Thank you for your participation

Appendix 2

ICO Minimum Case Log for Ophthalmology Residents

Speciality	Cases and examinations	Minimum case logs
Kornea & EED	Ocular Inflammation and Infection	30
	Infection and inflammation of lacrimal system	3
	Preseptal cellulitis	2
	Uveitis	5
	Skleritis	2
	Unusual infection etiology for posterior uveitis	2
	Axillary examination of Dry eye disease	20
Refraction, contact lens, and low vision	Subjective refraction	100
	Streak retinoscopy	50
	Spectacles prescription	20
	Contact lens fitting	20
	Low vision	20
Cataract and refractive surgery	Cataract examination	300
	Biometry	50
	Keratometry	50

	Ophthalmic USG	10
	Interferometry	20
	Cataract surgery	60
	Nd : YAG Kapsulotomi	2
Glaucoma	Applanation tonometry	100
	Gonioscopy	50
	Perimetry	50
	Retinometry	20
	OCT interpretation	50
	Direct and indirect funduscopy	300
	Laser peripheral iridotomy/iridectomy	2
	Trabeculectomy	2
Ophthalmic reconstructive and orbital oncology	Eyelid examination	20
	Occlusion of lacrimal passage	20
	Oncology and reconstructive surgery	20
	Complete management of Thyroid eye disease	2
	Levator surgery	1
	Globe rupture or adnexal injury surgery and complete management	15
Retina, Vitreous dan uvea	Retinal vascular disease	20
	Retinal detachments	10
	Macular disorder	20
	Complicated cases of retinal detachment	2
	FFA interpretation	10
	PRP laser	10
	B scan ophthalmic USG	10
	Intravitreal injection	10
Neuro-ophthalmology	Optic disc disorder (inflammation, toxic, ischemia, compression)	10
	Retrobulbar visual pathway disorder	5
	Motor neuroparesis	10
	Myasthenia gravis	2
Pediatric ophthalmology and Strabismus	Leukokoria	5
	<i>Retinopathy of prematurity</i>	2
	Pediatric refractive disorder	10
	Horizontal strabismus	2
	Ocular motility and strabismus examination	10
	BSV examination	20
	Retinal correspondence examination	10
	<i>Forced duction test</i>	10
	Motor neuro paresis	2
	Congenital/juvenile glaucoma	2
	Vertical strabismus	1
	Complete management of amblyopia	10
	Ophthalmic disorder from systemic disease	2
	Horizontal strabismus surgery	1

The Effect of COVID-19 Pandemic on Ophthalmology Residency Training
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Background: The COVID-19 pandemic is causing a crisis in health systems around the world, including residents' surgical and clinical training of various specialties. The purpose of this study was to provide the effects of COVID-19 on ophthalmology resident education. Given the uncertainty of the end of this pandemic, the resident's perspective can be used to

help the ophthalmologist education system adapt to changes during the pandemic. **Method:** Online surveys were distributed to ophthalmology resident in Airlangga University Surabaya, Indonesia. The survey contained questions about resident's opinion regarding online lectures conducted during the pandemic and the effects of the COVID-19 pandemic on scientific assignments and clinical skills target that must be met according to the standards of the Indonesian College of Ophthalmology (ICO). The data were analyzed using descriptive statistics. **Result:** 69 out of 72

residents participated in this study. From the observation, it was found that there was a significant decrease in patients so that only 7.4% of residents could meet their competency standards. There was no change in the number of hours of independent study but there were many obstacles to completing scientific assignments since the pandemic which caused 85.7% of residents to experience delays in completing assignments. As many as 91.8% of residents felt the COVID-19 pandemic would delay graduation. The negative effects of the Covid-19 pandemic were greater among senior residents ($p = 0.002$, $P < 0.01$).

Conclusion: The COVID-19 pandemic has a negative effect on ophthalmology residents' education. The decreased number of patients made it difficult for the residents to meet competency standards. The new regulations related to COVID-19 also cause obstacles to completing scientific assignments and have the potential to delay graduation of ophthalmology residents.

Keyword: COVID-19, Pandemic, Ophthalmology Resident

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