

# The Impact of the COVID-19 Pandemic on Surgical Practices in Ophthalmology at the National Referral Hospital in Yogyakarta



NalamTaqi Kayana Pradhanika<sup>1</sup>, Indra Tri Mahayana<sup>2</sup>, Reny Setyowati<sup>3</sup>, Firman Setya Wardhana<sup>4</sup>

<sup>1-4</sup>Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

## ABSTRACT

**Purpose:** To assess the impact of the COVID-19 pandemic on ophthalmic surgical practices at the National Referral Hospital in Yogyakarta by comparing surgical data from the pre-pandemic period with data collected during the pandemic.

**Study Design:** Retrospective comparative study.

**Methods:** Patient data were divided into two groups: pre-COVID and during-COVID. Demographic and surgical data were collected. Continuous variables (e.g., patient age, number of surgeries) were presented as mean ± standard deviation (SD), while categorical variables (e.g., type of surgery, gender distribution) were presented as frequencies and percentages. A paired t-test was used to compare continuous variables, and the Chi-square test was applied to compare proportions (e.g., elective vs. emergency surgeries). Statistical analysis was conducted using SPSS 25.0, with  $p < 0.05$  considered statistically significant.

**Results:** Among 4,578 patients, there was a +11.73% increase in total surgeries from pre-COVID to the COVID era ( $p > 0.05$ ). Based on surgery type, elective surgeries increased by +15.56% ( $p > 0.05$ ), while emergency surgeries significantly decreased by -60.51% ( $p < 0.05$ ). Cataract & Refractive Surgery, Glaucoma, Vitreo-Retinal Surgery, Infection & Immunology Surgery increased by +4.83% ( $p > 0.05$ ), +103.5% ( $p < 0.05$ ), +5.63% ( $p > 0.05$ ), +7.28% ( $p < 0.05$ ) and +26.8% ( $p > 0.05$ ) respectively. While reconstructive, oculoplastic & oncology Surgery decreased by -5.36% ( $p > 0.05$ ).

**Conclusion:** The COVID-19 pandemic led to a significant decrease in emergency surgeries while increasing elective procedures, particularly in glaucoma and pediatric ophthalmology.

**Keywords:** COVID-19, Ophthalmic surgery, pandemic, emergency surgery, Glaucoma, Cataract.

**How to Cite this Article:** Pradhanika NTK, Mahayana IT, Setyowati R, Wardhana FS. The Impact of the COVID-19 Pandemic on Surgical Practices in Ophthalmology at the National Referral Hospital in Yogyakarta. 2025;41(2):137-145. **Doi: 10.36351/pjo.v41i2.1987**

---

*Correspondence: Indra Tri Mahayana  
Faculty of Medicine, Public Health and Nursing,  
Universitas Gadjah Mada, Yogyakarta, Indonesia  
Email: tri.mahayana@gmail.com*

---

*Received: November 12, 2024*

*Revised: January 29, 2025*

*Accepted: February 10, 2025*

## INTRODUCTION

During the COVID-19 days, the health sector was particularly affected, and many adjustments were

made depending on the need of the patient and the hospital to reduce the rate of viral transmission. Ophthalmology was one of the most affected fields in terms of patient numbers and surgeries considering the examinations that needed contact with both examiner and the equipment.

The first coronavirus outbreak started from Wuhan and the World Health Organization (WHO) declared it a Public Health Emergency of International Concern (PHEIC) on January 30<sup>th</sup> 2020 and a Pandemic.<sup>1</sup> Many adjustments were made due to implementation of mobility restrictions and social

distancing as a part of emergency response.<sup>1</sup>

Ophthalmology has been one of the most affected in terms of patient numbers and surgeries.<sup>3</sup> Ocular examination needs a direct contact with both the examiner and the equipment and ocular surfaces were a source of disease transmission which might further infect the ophthalmologist.<sup>4</sup> It was recommended that all ophthalmologists should restrict their treatment to urgent and emergency cases. Any non-urgent cases were instructed to be postponed and/or be followed up until further notice in order to reduce the risk of direct transmission.<sup>5</sup>

The same problem also arose in Sardjito General Hospital, which is a tertiary referral hospital. The number of COVID-19 positive patients exceeded the normal ward capacity, resulting in shifting of non-COVID-19 wards to COVID-19 ward. Sardjito General Hospital converted approximately 60% of their beds to be used as COVID-19 patients' beds. This situation resulted in reduced number of bed capacity for patients who needed surgical management, including ophthalmology patients. A massive reduction in number of surgeries happened due to consideration of strict policy of the hospital and government to reduce the transmission of infection.<sup>6</sup>

## METHODS

This was a retrospective study in which data was

obtained from the patients' medical records who underwent emergency and elective ophthalmic surgery in Sardjito General Hospital, one year before and during COVID-19, from February 2019 to February 2020 and then March 2020 to March 2021, respectively. The study got approval from the Ministry of Health and mentioned in Governments Policy No. 21/2020. PSBB (KE/FK/0431/EC/2023). Demographic data/characteristics in the form of numerical variables represented in the form of mean and standard deviation, while numerical or categorical data were presented as percentage. Changes were presented in the form of differences in numbers, and the percentage of changes with 95% Confidence Interval. Categorical variables were analyzed using Chi-square test, and numerical variables with T-test. Analysis was done using SPSS 25.0 and statistical significance was considered when  $p < 0.05$ .

## RESULTS

There were 4578 patients who underwent ophthalmic surgery in Sardjito General Hospital. They were divided into pre-pandemic period with 2132 patients and pandemic period with 2446 patients. Table 1 shows the demographic characteristics including gender, types of anesthesia, age, and surgical procedures (elective and emergency).

The mean age of the study group in pre and during

**Table 1:** Demographic data.

	Pre-Pandemic n(SD) or n(%)	During Pandemic n(SD) or n(%)	All Patients N(SD) or N(%)
Age, mean (SD)	47.51 ± 19.12	47.86 ± 18.99	
Sex			
- Male	1185 (25.88)	1351 (29.51)	2536 (55.4)
- Female	990 (21.63)	1095 (23.92)	2085 (45.54)
Type of Surgery			
- Elective surgery	2025 (44.23)	2402 (52.47)	4427 (96.7)
- Emergency surgery	107 (2.34)	44 (0.96)	151 (3.3)
Anesthesia used.n (%)			
- General anesthesia	1021 (22.30)	1220 (26.65)	2241 (22.30)
- Local anesthesia	1111 (24.27)	1226 (26.78)	2337 (24.27)
Subdivisions.n (%)			
- Cataract & Refractive	490 (10.7)	533 (11.64)	1023 (22.35)
- Glaucoma	196 (4.28)	392 (8.56)	588 (12.84)
- Vitreo Retina	684 (14.94)	764 (16.69)	1448 (31.63)
- PO-Strabismus	99 (2.16)	120 (2.62)	219 (4.78)
- ROO	393 (8.58)	367 (8.02)	760 (16.6)
- Infection & Immunology	270 (5.9)	270 (5.9)	540 (11.8)
Total patient.n (%)	2132 (46.57)	2446 (53.43)	4578 (100)

Abbreviation: n. number; PO-Strabismus, Pediatric Ophthalmology-Strabismus; ROO, reconstruction, oculoplastic, and oncology; SD, standard deviation

pandemic period showed slight increase which are  $47.51 \pm 19.12$  and  $47.86 \pm 18.99$ , respectively. Male predominance was observed in both periods, while the gender distribution was similar as in 2019.

Table 2 provides a detailed analysis of the pandemic's impact on ophthalmic surgeries across different subdivisions and surgery types. While most categories showed an increase in cases, the number of Emergency and Reconstructive, Oculoplastic, and Oncology (ROO) surgeries declined. Emergency and

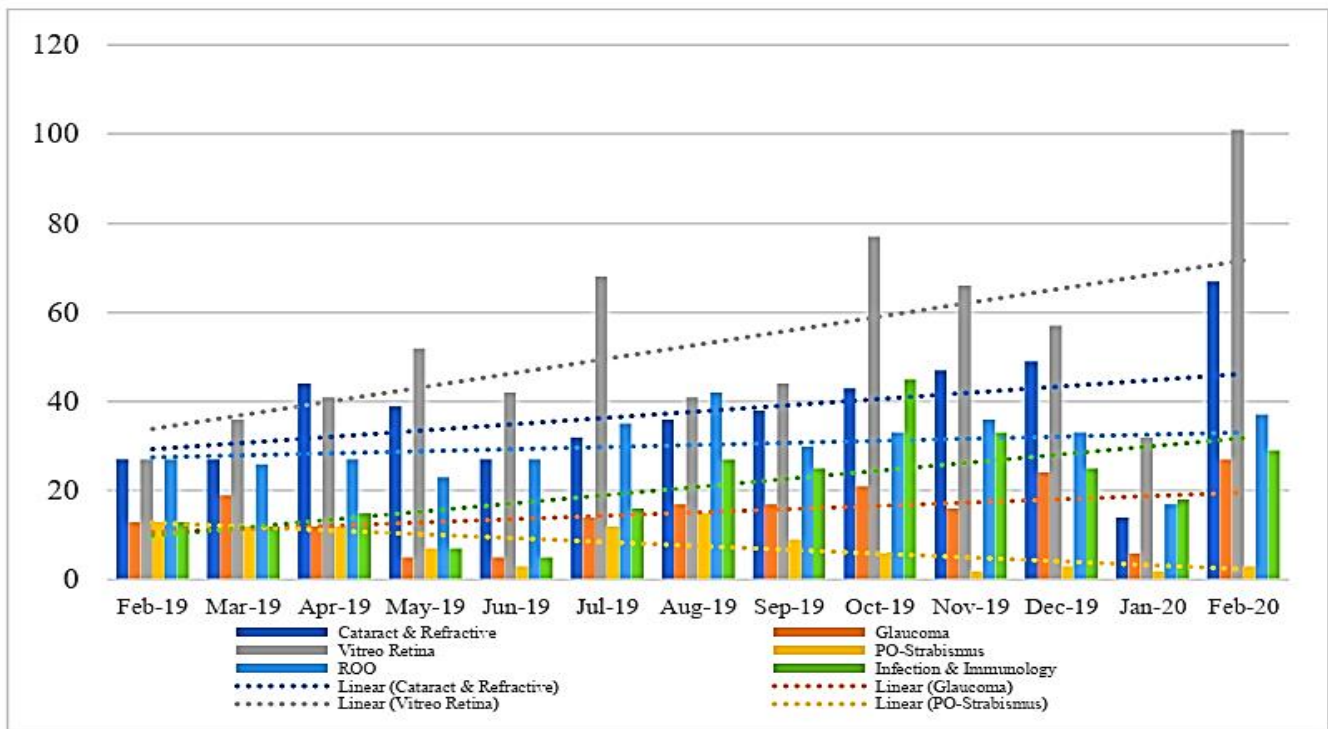
Glaucoma surgeries exhibited statistically significant changes ( $p < 0.05$ ), with 95% confidence intervals ranging from 1.132 to 8.830 for Emergency and -24.460 to -6.889 for Glaucoma.

In Figure 1, the trend lines identified pattern for each subdivision with the same starting and ending point. Cataract and Refractive, Glaucoma, Vitreo Retina, and Infection and Immunology subdivisions had a positive slope. Cataract and Refractive subdivision had a flat line with no extreme elevation

**Table 2:** Impact of Pandemic on Ophthalmic Surgery Based on Subspecialty and Types of Surgery.

	Pre-Pandemic n(SD) or n(%)	During Pandemic n(SD) or n(%)	Changes (%) <sup>b</sup>	95% CI	p-value <sup>a</sup>
Number of patient	164 ± 49.03	183.25 ± 65.31	+11.73	-66.780 to 28.280	0.411
Type of Surgery					
- Elective	155.77 ± 48.74	180 ± 64.18	+15.56	-71.147 to 22.686	0.296
- Emergency	8.23 ± 6.04	3.25 ± 2.42	-60.51	1.132 to 8.830	0.014*
Sub Division Case					
- Cataract & Refractive	38.08 ± 13.19	39.92 ± 19.76	+4.83	-15.634 to 12.344	0.785
- Glaucoma	15.15 ± 6.99	30.83 ± 12.74	+103.5	-24.460 to -6.889	0.002*
- Vitreo Retina	52.85 ± 20.89	55.83 ± 18.8	+5.63	-19.481 to 13.506	0.711
- PO-Strabismus	7.69 ± 4.85	8.25 ± 7.88	+7.28	-5.922 to 4.806	0.832
- ROO	28 ± 8.25	26.5 ± 10.41	-5.36	-6.236 to 9.236	0.692
- Infection & Immunology	14.85 ± 7.11	18.83 ± 5.62	+26.8	-9.319 to 1.344	0.136

\*p<0.05. Abbreviation: CI, confidence interval; n, number; PO-Strabismus, Pediatric Ophthalmology-Strabismus; ROO, reconstruction, oculoplastic, and oncology; SD, standard deviation



**Figure 1:** Subdivisions Changes During Pre-Pandemic.

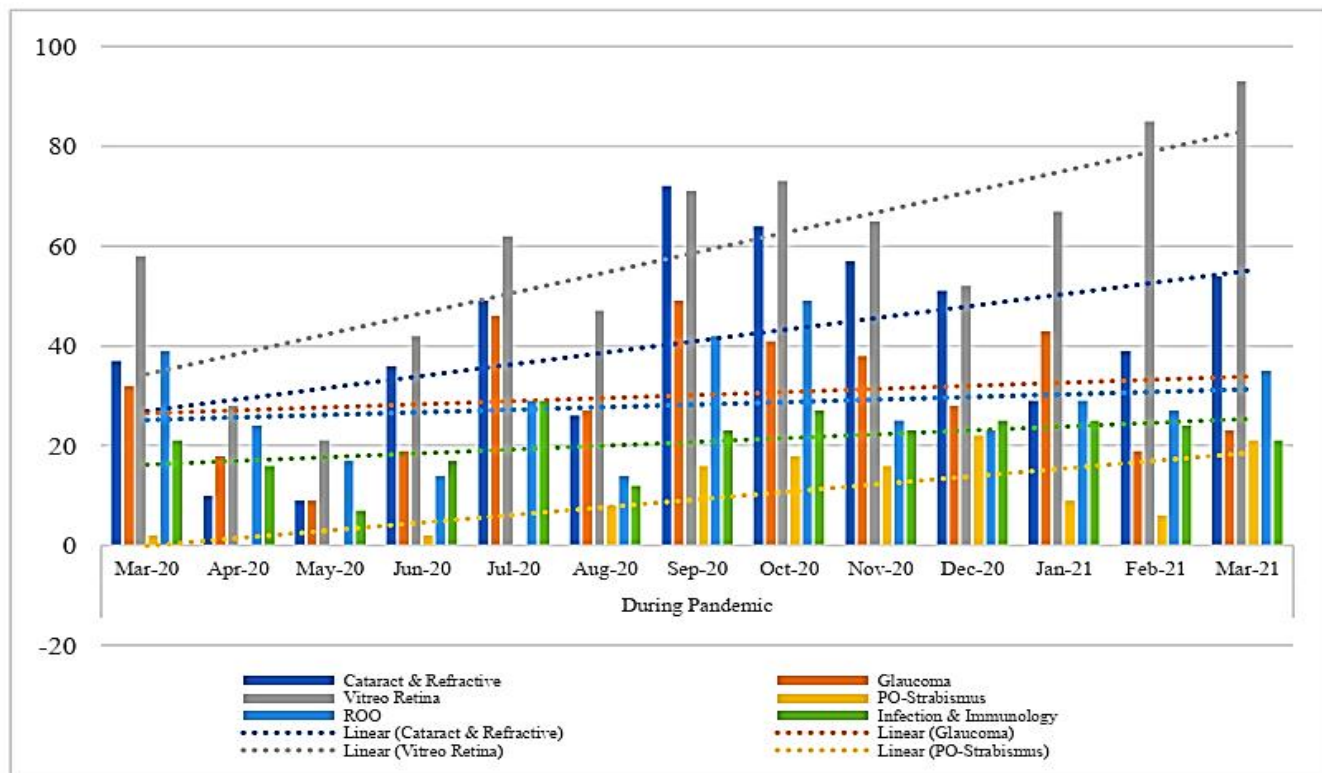


Figure 2: Subdivisions Changes During Pandemic.

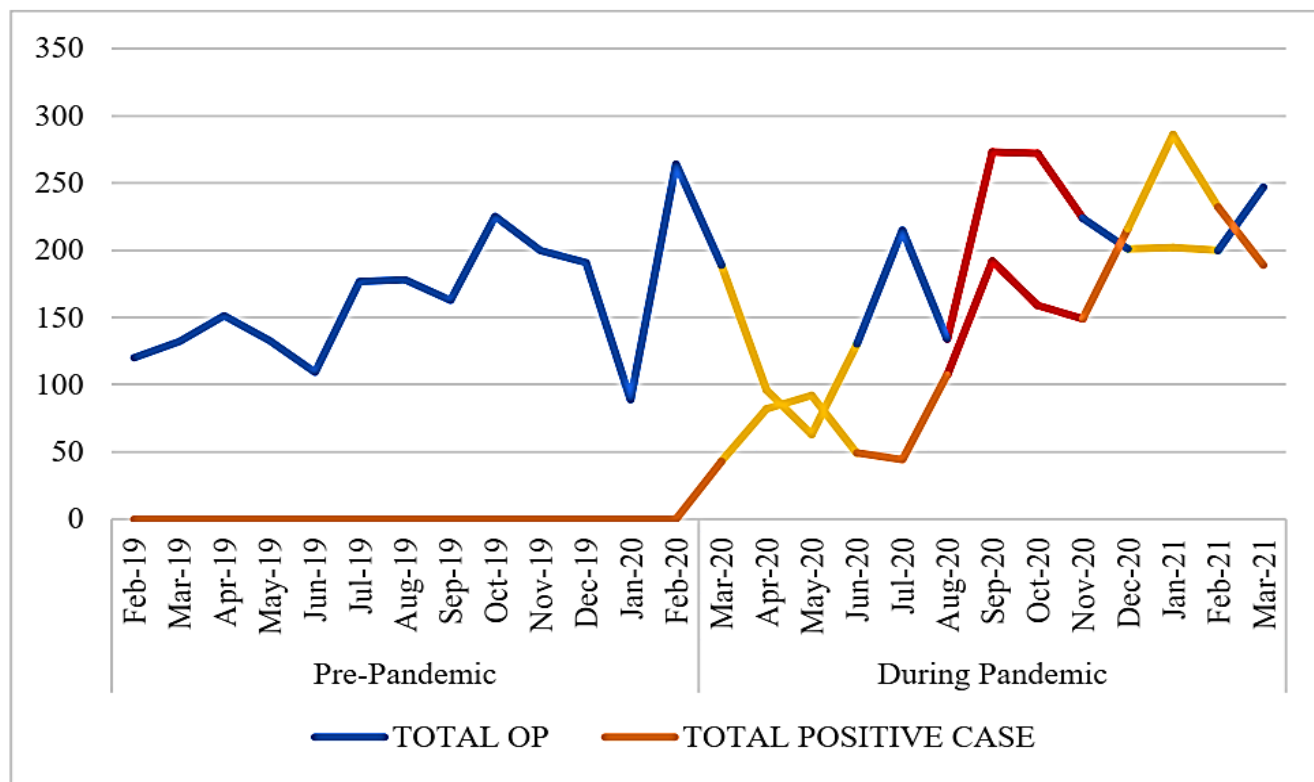


Figure 3: Comparison of Total Ophthalmic Surgery and COVID-19 Patient in Sardjito General Hospital. Blue line means total operation and red line means total positive case of COVID-19.

meaning there was no massive increase in the number of surgeries. PO-Strabismus has negative slope trendline, meaning that the vertical value of the right side is smaller, indicating a reduced number of surgeries done.

Figure 2 depicts the overall trend lines with a positive slope for a significant rise in patient's number between March 2020 and March 2021. Cataract and Refractive as well as Glaucoma subdivision trendline is constant compared to other subdivisions.

A sudden drop in total ophthalmic surgeries during the first three months of pandemic could be seen in Figure 3. A progressive increase in the following months is also observed. However, a drop was visible in the month of August 2020 and January 2021 as the first wave of COVID-19 in Indonesia was marked. Yellow colored lines marked when the total of COVID-19 positive case increased while the total of ophthalmic surgery decreased. Red colored lines marked the phenomenon of increased both total COVID-19 positive cases and the ophthalmic surgery.

## DISCUSSION

The results of this study have shown that there is a mean increase (+11.73%,  $p > 0.05$ ) in the number of surgeries during the pandemic period. This is contrary to a study conducted by Al-Kharashi et al, which mentioned that lockdowns due to COVID-19 had a major impact on ophthalmic practices as 4.4% of the patients had experienced a postponement of necessary interventions.<sup>7</sup>

This study findings are not overall in agreement with data obtained from different studies due to the rise of ophthalmic surgeries after the establishment of COVID-19's first case in Indonesia as seen in Figure 3. There was reduced access to primary care providers during the early months of lockdown. Another consequence of the pandemic was closure of the surrounding ophthalmology offices. Many patients were unable to obtain surgical care locally, hence they were referred to Sardjito General Hospital with a fully operational, 24-hour emergency room receiving referrals and ease of access to operating rooms.

During the first 3 months of pandemic (March 2020–May 2020), sudden drop in the number of patients was observed and increased to exceed monthly average by June 2020 as seen in Figure 3. This might be due to the difficulties found during the

pandemic, for examples difficulty in the availability of public transport and fear of getting infected by COVID-19 during transport. In Indonesia, the shortage of healthcare professionals is a major challenge, driven by an insufficient physician-to-population ratio amid rising confirmed and suspected COVID-19 cases. The surge in hospitalizations, particularly among COVID-19 patients, has led to the overutilization of medical supplies and increased demand for limited medical equipment, such as ventilators.<sup>8</sup> At the start of the pandemic, only a few hospitals in Yogyakarta were open and equipped to handle both COVID-19 and non-COVID-19 patients. According to Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/Menkes/169/2020, the designated referral hospitals for infectious and emerging diseases included Sardjito General Hospital, Panembahan Senopati General Hospital, Yogyakarta General Hospital, and Wates General Hospital.<sup>9</sup> The limited number of referral hospitals contributed to the overload of COVID-19 patients, leading to a decline in surgical procedures as wards and operating rooms were repurposed for COVID-19 care. Postponing non-urgent surgeries became a necessary measure to manage resources effectively. After the first three months of the pandemic, ophthalmic surgery rates began to rebound. According to Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/Menkes/230/2021, designated referral hospitals, including ours, were required to implement new healthcare strategies to manage the ongoing surge in COVID-19 cases.<sup>10</sup> These strategies included: Repurposing hospital spaces into ICUs or isolation rooms, establishing off-site health services for mild and asymptomatic COVID-19 patients, expanding emergency facilities, such as Sardjito General Hospital, which set up an outdoor emergency unit and built additional ICUs in the parking building, enhancing patient communication through regular messages and educational videos about hospital safety protocols, increasing patient confidence in seeking medical care.<sup>11</sup> In conclusion, both patients and the healthcare system adapted to these unprecedented conditions, demonstrating resilience and flexibility in response to the pandemic.

In the figures and graphs, distinct colors represent distinct phases of changes in the total number of ophthalmic surgeries. Yellow lines indicate periods when COVID-19 cases increased while ophthalmic surgeries declined, observed from March–June 2020

and December 2020–February 2021. Red lines mark periods when both COVID-19 cases and ophthalmic surgeries increased, notably from August–November 2020. From March to June 2020, the Indonesian government implemented a national large-scale social restriction program (Pembatasan Sosial Berskala Besar, PSBB) from April 10 to June 4, 2020, under Government Policy No. 21/2020, to curb the spread of COVID-19. The PSBB rollout varied by region, starting in Jakarta and expanding to surrounding cities based on infection trends.

However, Yogyakarta did not fully adopt PSBB, citing financial constraints in ensuring residents' basic needs during lockdowns.<sup>12</sup> Everyday activities such as schools, public transportation, workplaces, and religious gatherings continued, potentially contributing to higher transmission rates. COVID-19 cases in Yogyakarta peaked in densely populated city centers, likely influenced by resident mobility and urban crowding, further accelerating the spread.<sup>13</sup>

From August to November 2020, PSBB was implemented in Yogyakarta in response to a sharp increase in COVID-19 cases, while restrictions were being loosened in other regions. PSBB remained in effect until early 2021, when it was replaced by PPKM (Pemberlakuan Pembatasan Kegiatan Masyarakat), a new system of community activity restrictions.

PPKM was specifically enforced in Java and Bali, where infection rates were higher than in other regions. Unlike PSBB, PPKM allowed residents to continue daily activities while adhering to strict health protocols, including wearing masks, hand hygiene, and social distancing.<sup>1,12</sup> Due to the lack of early case detection through testing and ineffective contact-tracing systems, the extension of PSBB failed to significantly curb the spread of COVID-19, leading to a continued rise in positive cases.<sup>12</sup>

Change in Emergency and Glaucoma surgery was statistically significant ( $p < 0.05$ ). However, age, sex, Elective surgery, and the other subdivisions: Cataract and Refractive, Vitreo Retina, PO-Strabismus, Infection and Immunology means were not significantly different ( $p > 0.05$ ), yet there was a change in numbers.

The volume of emergency ophthalmic surgery fell by -60.51% ( $p < 0.05$ ) during the pandemic. Decrease of ophthalmic emergency surgery might be due to limited access to the operation theatres, limited staff, and the fear of getting infected by COVID-19,

especially in Sardjito General Hospital which was a national referral hospital. As mentioned by a previous study by Tebala et al, an overall reduction in surgical emergency admission was 36%.<sup>14</sup> The general reduction of admission is not utterly clear, but it might be due to the government policies of lockdowns and self-isolation. The patients were also reluctant to reach the emergency department to avoid being infected.

On the other hand, there was an increase in elective surgery during pandemic to +15.56 ( $p > 0.05$ ). It could be because the patients were admitted through poly clinics and had their surgeries done at the central operating theatre and considered to be an elective case based on the operation room used. Moreover, Sardjito General Hospital is designated by the Ministry of Health as a referral hospital for infectious and emerging diseases, was required to accommodate more referral patients from primary and secondary healthcare facilities. A study in Egypt reported that 72.7% of ophthalmologists continued to see patients and perform elective surgeries, believing that strict safety protocols minimized risks. Among those most willing to proceed with surgeries were refractive, corneal, and retinal surgeons.<sup>5</sup>

Despite the pandemic restrictions placed on elective surgeries during the COVID-19 pandemic, glaucoma surgeries were classified as urgent and were regularly performed.<sup>15</sup> Contrary to this another study reported decreased number of glaucoma procedures - 37% when compared to 2019 or pre-pandemic period.<sup>16</sup> Pandemic lockdowns, especially several months earlier had affected treatment of glaucoma which led to a rise in primary and secondary glaucoma and its aggravation, leading to more surgical interventions.<sup>17</sup>

Patients who qualified for surgery during the pandemic had significantly higher intraocular pressure (IOP) compared to those before the pandemic. Lockdowns may have hindered regular eye check-ups and medication access, leading to uncontrolled IOP.<sup>18</sup>

The importance of routine follow-ups in glaucoma management is well-documented, with studies showing a correlation between disease progression and inadequate follow-up. A study in India found that the pandemic worsened glaucoma conditions, increasing the number of high-risk patients and emergency cases.<sup>17</sup> Patients presented with more severe vision loss, higher IOP, advanced cataracts, and significant

optic disc damage compared to the pre-pandemic period. Many patients delayed seeking care and only presented after lockdown restrictions were eased, leading to a surge in cases from May 2020 onward, as shown in Figure 2.

The Vitreo Retina subdivision had the highest number of patients, totaling 1,448 throughout the pre-pandemic and pandemic periods, with a +5.63% increase ( $p > 0.05$ ), as shown in Table 2. Vitreo retinal surgery includes procedures targeting the retina, macula, and vitreous fluid. The pattern of patient visits to ophthalmology departments also shifted during lockdowns. A study by Cetinkaya reported an increase in the proportion of retinal surgeries during the pandemic.<sup>19</sup>

Retinal surgery is more common in middle aged and older adults, who had stayed at home for over one year after the first case of COVID-19 had been announced.<sup>19</sup> This can also be attributed to increase in the number of diabetic patient. Most of the patients already had their symptoms for approximately 2-6 months prior to visiting the hospital.<sup>20</sup> Patients presented late due to the fear of getting COVID.

The number of cataract and refractive surgeries showed a non-significant increase of +4.83% ( $p > 0.05$ ) during the pandemic. This finding contrasts with previous studies, which reported a 5.6% decrease in cataract surgeries.<sup>11</sup> A case study by Kim et al, suggested a correlation between COVID-19 vaccines and cataract formation. mRNA vaccines (BNT162b2 and mRNA-1273) use purified RNA with nucleotide modifications to induce a mild type-1 IFN innate immune response and generate adaptive immunity. This mechanism has been linked to rare ophthalmic manifestations, affecting the cornea, uvea, retina, and vasculature.<sup>21</sup> The Refractive Surgery Council reported a 16.3% increase in surgery in 2020 (during pandemic period).<sup>22</sup> It was probably due to increase in near work, screen time, and decreased in outdoor activities. There was a work from home policy and lockdowns which could have exacerbated a larger trend towards near work-induced myopia.<sup>23</sup>

The Pediatric Ophthalmology and Strabismus subdivision experienced a +7.28% increase ( $p > 0.05$ ) during the pandemic. A previous study conducted in a pediatric tertiary care hospital in Montreal, Quebec, reported a reduction in pediatric ophthalmology visits.<sup>24</sup> However, in this study, Sardjito General Hospital may have been the only tertiary referral hospital accepting pediatric ophthalmology patients

requiring surgery. A study by Cetinkaya observed an increase in trauma-related surgeries, whereas this study found a decrease in ROO surgeries by -5.36% ( $p > 0.05$ ).<sup>19</sup> This decline may be attributed to work-from-home regulations, which reduced outdoor activities and potential accidents. The decrease in traffic accidents, assaults, and workplace injuries contributed to the lower number of trauma-related eye surgeries.<sup>25</sup>

The Infection and Immunology subdivision saw an increase of +26.8% ( $p > 0.05$ ) in surgeries during the pandemic, though the total number of procedures remained at 270, as shown in Table 1. Most of these surgeries focused on corneal conditions, including corneal transplantation. While corneal transplants and donations declined globally during the pandemic, these changes did not impact on the Infection and Immunology surgeries at Sardjito General Hospital.

Limitations of the study include its retrospective design, single national referral hospital and lack of Long-Term Follow-Up. The study focuses on the immediate impact of the COVID-19 pandemic on ophthalmic surgeries, without assessing long-term patient outcomes. The shift in hospital priorities during the pandemic may have affected data recording and classification, potentially impacting accuracy.

## CONCLUSION

This study examined the impact of the COVID-19 pandemic on ophthalmic surgical practices. The findings indicate that the pandemic significantly affected the ophthalmology department at Sardjito General Hospital, particularly in the Emergency and Glaucoma subdivisions. While surgical delays were inevitable, the overall number of patients admitted for eye surgery increased, reflecting the continued demand for eye care, improved understanding of COVID-19, and enhanced preventive measures among healthcare providers.

**Funding:** None.

**Patient's Consent:** Researchers followed the guidelines set forth in the Declaration of Helsinki.

**Conflict of Interest:** Authors declared no conflict of interest.

**Ethical Approval:** The study was approved by the Institutional review board/Ethical review board (KE/FK/0431/EC/2023).

## REFERENCES

1. Kementerian Kesehatan Republik Indonesia. Guidelines for Prevention and Control of Coronavirus Disease (COVID-19). [*Pedoman Pencegahan dan Pengendalian Coronavirus Disease (COVID-19)*]. 4th ed. Jakarta: Direktorat Jenderal Pencegahan dan Pengendalian Penyakit; 2020. available at: <https://infeksiemerging.kemkes.go.id/document/pedoman-pencegahan-dan-pengendalian-covid-19/view>. Accessed: 10 February 2025
2. **Xiao H, Dai X, Wagenaar BH, Liu F, Augusto O, Guo Y, et al.** The impact of the COVID-19 pandemic on health services utilization in China: Time-series analyses for 2016-2020. *Lancet Reg Health West Pac.* 2021;**9**:100122. Doi: 10.1016/j.lanwpc.2021.100122.
3. **Awan MA, Shaheen F, Mohsin F.** Impact of COVID-19 lockdown on Retinal Surgeries. *Pak J Med Sci.* 2021;**37**(7):1808-1812. Doi: 10.12669/pjms.37.7.4291.
4. **Lu CW, Liu XF, Jia ZF.** 2019-nCoV transmission through the ocular surface must not be ignored. *Lancet.* 2020;**395**(10224):e39. Doi: 10.1016/S0140-6736(20)30313-5.
5. **Abdullatif AM, Makled HS, Hamza MM, Macky TA, El-Saied HMA.** Change in Ophthalmology Practice during COVID-19 Pandemic: Egyptian Perspective. *Ophthalmologica.* 2021;**244**(1):76-82. Doi: 10.1159/000510548.
6. **Soleimani M, Mehrpour M, Mohammad-Rabei H.** Ophthalmic practice during COVID-19 pandemic. *Int J Ophthalmol.* 2021;**14**(5):639-642. Doi: 10.18240/ijo.2021.05.01.
7. **Alkharashi MS, Alsharif HM, Altahan FA, Alrashed AW, Abdulghani M.** The Impact of the COVID-19 Pandemic on Ophthalmic Outpatient Care in a Tertiary Care Center in Riyadh. *Healthcare (Basel).* 2022;**10**(9):1654. Doi: 10.3390/healthcare10091654.
8. **Mahendradhata Y, Andayani NLPE, Hasri ET, Arifi MD, Siahaan RGM, Solikha DA, et al.** The Capacity of the Indonesian Healthcare System to Respond to COVID-19. *Front Public Health.* 2021;**9**:649819. Doi: 10.3389/fpubh.2021.649819.
9. **Kementerian Kesehatan Republik Indonesia.** Determination of Referral Hospitals for the Management of Certain Emerging Infectious Diseases. [*Penetapan Rumah Sakit Rujukan Penanggulangan Penyakit Infeksi Emerging Tertentu*]. HK.01.07/MENKES/275/2020 Indonesia; 2020. available at: <https://pusatkrisis.kemkes.go.id/penetapan-rujukan-penanggulangan-penyakit-infeksi-emerging-tertentu>. accessed 10 February 2025
10. **Kementerian Kesehatan Republik Indonesia.** Guidelines for Organizing Field Hospitals/Emergency Hospitals During the Corona Virus Disease 2019 (COVID-19) Pandemic. [*Pedoman Penyelenggaraan Rumah Sakit Lapangan/Rumah Sakit Darurat Pada Masa Pandemi Corona Virus Disease 2019 (COVID-19)*]. HK.01.07/MENKES/230/2021 2021. Available at: <https://peraturan.bpk.go.id/Details/171632/keputusan-menkes-no-hk0107menkes2302021>. Accessed 10 February 2025.
11. **Das AV, Reddy JC.** Year one of COVID-19 pandemic: Effect of lockdown and unlock phases on cataract surgery at a multi-tier ophthalmology network. *Indian J Ophthalmol.* 2021;**69**(10):2818-2823. Doi: 10.4103/ijo.IJO\_1568\_21.
12. **Yudhana FW.** The Role of the Special Region of Yogyakarta Provincial Government, the Society, and the Private Sector in Handling Covid-19. In 2023. p. 240–52. Available at: <https://www.atlantispress.com/proceedings/yicgh-22/125989009> Accessed 10 February 2025.
13. **Cendana WP, Silmina EP, Dana SR.** Mapping Design of The Impact of Covid-19 in Yogyakarta Using SIG. *Procedia EngLife Sci.* 2021;**1**(2). Doi:10.21070/pels.v1i2.1152
14. **Tebala GD, Milani MS, Bignell M, Bond-Smith G, Lewis C, Cirocchi R, et al.** CovidICE-International Collaborative. Emergency surgery admissions and the COVID-19 pandemic: did the first wave really change our practice? Results of an ACOI/WSES international retrospective cohort audit on 6263 patients. *World J Emerg Surg.* 2022;**17**(1):8. Doi: 10.1186/s13017-022-00407-1.
15. **Dub N, Gołaszewska K, Saeed E, Dmuchowska DA, Obuchowska I, Konopińska J.** Changes to glaucoma surgery patterns during the coronavirus disease 2019 pandemic: a shift towards less invasive procedures. *Ann Med.* 2023;**55**(1):224-230. Doi: 10.1080/07853890.2022.2157474.
16. **González-Martín-Moro J, Guzmán-Almagro E, Izquierdo Rodríguez C, Fernández Hortelano A, Lozano Escobar I, Gómez Sanz F, et al.** Impact of the COVID-19 Lockdown on Ophthalmological Assistance in the Emergency Department at a Spanish Primary Level Hospital. *J Ophthalmol.* 2021;**2021**:8023361. Doi: 10.1155/2021/8023361.
17. **Yadav M, Tanwar M.** Impact of COVID-19 on glaucoma management: A review. *Front Ophthalmol (Lausanne).* 2022 Sep 28;**2**:1003653. Doi: 10.3389/fopht.2022.1003653.
18. **Schuster AK, Erb C, Hoffmann EM, Dietlein T, Pfeiffer N.** The Diagnosis and Treatment of Glaucoma. *Dtsch Arztebl Int.* 2020;**117**(13):225-234. Doi: 10.3238/arztebl.2020.0225.



19. **Cetinkaya YF.** Ophthalmic surgeries before and during the covid-19 outbreak in a tertiary hospital. *Int Ophthalmol.* 2023;**43(5)**:1565-1570. Doi: 10.1007/s10792-022-02555-4.
20. **Breazzano MP, Nair AA, Arevalo JF, Barakat MR, Berrocal AM, Chang JS, et al.** Frequency of Urgent or Emergent Vitreoretinal Surgical Procedures in the United States During the COVID-19 Pandemic. *JAMA Ophthalmol.* 2021;**139(4)**:456-463. Doi: 10.1001/jamaophthalmol.2021.0036.
21. **Kim DH, Hsu D, Li Y, Sulewski ME.** Cataracts in setting of multisystem inflammation after COVID-19 vaccination. *Am J Ophthalmol Case Rep.* 2022;**27**:101654. Doi: 10.1016/j.ajoc.2022.101654.
22. **Bickford M, Rocha K.** Impact of the COVID-19 Pandemic on Refractive Surgery. *Curr Ophthalmol Rep.* 2021;**9(4)**:127-132. Doi: 10.1007/s40135-021-00280-2.
23. **Enthoven CA, Tideman JWL, Polling JR, Yang-Huang J, Raat H, Klaver CCW.** The impact of computer use on myopia development in childhood: The Generation R study. *Prev Med.* 2020;**132**:105988. Doi: 10.1016/j.ypmed.2020.105988.
24. **Chaudhry Z, Santhakumaran S, Schwartz J, Toffoli D.** Impact of COVID-19 on pediatric ophthalmology in the epicentre of the Canadian outbreak. *Can J Ophthalmol.* 2023;**58(1)**:e16-e17. Doi: 10.1016/j.jcjo.2022.02.007.
25. **Escribano Villafruela J, de Urquía Cobo A, Martín Luengo F, Antón Modrego V, Chamorro González-Cuevas M.** Changing trends in ophthalmological emergencies during the COVID-19 pandemic. *PLoS One.* 2022;**17(5)**:e0268975. Doi: 10.1371/journal.pone.0268975.

### Authors Designation and Contribution

Nalam Taqi Kayana Pradhanika; *Student: Concepts, Design, Literature search, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

Indra Tri Mahayana; *Ophthalmologist: Concepts, Design, Literature search, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

Reny Setyowati; *Ophthalmologist: Concepts, Design, Data analysis, Statistical analysis, Manuscript review.*

Firman Setya Wardhana; *Consultant Ophthalmologist: Concepts, Design, Data acquisition, Statistical analysis, Manuscript review.*

