Ophthalmic Emergency-Room Visits During The COVID-19 Pandemic – A Comparative Study

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Abstract

**Purpose:** To compare ophthalmic emergency room (OER) visits during the COVID-19 pandemic to those during a control period.

**Methods:** We compared all visits to the OER from March 15\(^{th}\) to April 15\(^{th}\), 2020, during the Covid-19 pandemic and government mandated quarantine, to the same period in 2019. Factors analyzed were patient demographics, chief complaints, referral patterns, exam findings, treatments given, hospitalizations and surgical interventions.

**Results:** We included in this study 1311 visits of 1158 patients, 477 during the 2020 COVID-19 pandemic and 834 during the same period in 2019. The demographic distribution (age, gender, and ethnicity) was similar between the two periods. LogMAR visual acuity at presentation was worse during the COVID-19 pandemic (0.42±0.6 and 0.34±0.5 in 2020 and 2019 respectively; p=0.025) and the number of emergent surgeries was higher (3.8% in 2020 vs 1.8% in 2019, p=0.024). There was a higher likelihood of involvement of both segments of the eye (4.82% versus 1.2%, p<0.01) and more diagnoses were given to each patient (1±0.5 versus 0.93±0.35, p=0.001; During the COVID-19 pandemic medications (both topical and systemic) were prescribed more often (1.22±0.95 in 2020 and 0.84±0.67 in 2019, p < 0.001).

**Conclusions:** OER visits were less frequent during the COVID-19 pandemic as compared to 2019, though the demographics of the patients remained unchanged. Visits during the pandemic tended to be for more severe ocular conditions and required more medical and surgical treatment. This analysis can aid healthcare resource management in similar scenarios in the future.

What Was Known

What was known:

1. Visits to the Ophthalmic emergency room (OER) are unplanned events, the nature of which depend on living patterns that were dramatically affected by the COVID-19 pandemic.

What this paper adds:

1. OER visits during the COVID-19 pandemic tended to be for more severe ocular conditions and required more testing as well as more medical and surgical treatment.

2. As compared to the previous year, the demographics of the patients remained unchanged.

Introduction

The COVID-19 pandemic has had a significant effect on health care delivery in a wide variety of medical disciplines [1–3]. These effects were due to the different allocation of resources within the health care system, and different patterns of health care consumption. Between March 15th and April 15th, 2020, like many parts of the world, Israel was under government mandated quarantine and people were instructed...
to limit their outings from home to a minimum. During this time, public hospitals in Israel were re-organized to prepare for the possible increase in COVID-19 related morbidity. In Ophthalmology departments, several changes were made. First, all non-urgent testing and surgeries were cancelled. Second, clinic volumes were lowered significantly and the number of on-site ophthalmologists was reduced. Third, tele-medicine was introduced to allow for continuation of care without frontal doctor-patient meetings whenever possible. Importantly, during the COVID-19 epidemic the strictest limitations were placed on people over the age of 65 as morbidity and mortality in this age group were shown to be significantly higher as compared to younger patients.

Visits to the Ophthalmic emergency room (OER) are unplanned events, the nature of which depend on several factors. These factors include living patterns that were dramatically affected by the COVID-19 pandemic, and the prevalence of diseases in the population[4]. The purpose of this study was to evaluate the nature of visits to the OER, to assess the care given in this setting during the COVID-19 pandemic, and to compare these to a control period. We believe this analysis can aid healthcare resource management in means of anticipating, preparing, and mobilizing resources to improve and mitigate treatment and morbidity.

**Materials And Methods**

**Participants:**

This retrospective study was approved by the Institutional Review Board of the Meir Medical Center. Meir Medical Center is the 7th largest hospital complex in Israel, serving a population of approximately 750,000 people. We reviewed the files of consecutive OER visits between March 15th and April 15th, 2020 which was during the COVID-19 pandemic, and during the same time period in 2019. All OER visits were included in the study, and none were excluded.

**Data collection:**

Data was recorded from the electronic medical record (EMR) of the OER visits. Collected parameters included patient demographics (age, gender and ethnicity), chief complaints, visual acuity, main clinical findings and management (auxiliary tests, medications prescribed, hospitalization and surgery). For the purposes of statistical analysis the Logarithm of the Minimum Angle of Resolution) LogMAR (equivalent for counting fingers was 1.85, hand motion was 2.3, light perception was 2.8, and no light perception was 2.9 [5]. Distance from hospital was calculated using the nearest route suggested by Google Maps. Referral patterns were classified as self-referred, referred from a non-ophthalmologist physician, referred from a primary care ophthalmologist or a follow up from a prior visit to our clinic. Non-urgent visits were defined by minimal effect on visual acuity and mild discomfort [6].

**Statistical analysis:**

Data was analyzed with the SPSS software for windows version 20.0 by IBM. For the analysis of continuous data Student's t-test was used for normally distributed variables and Kruskal-Wallis for non-
parametric variables. For the analysis of categorical variables, Chi-Square or Fishers’ exact test were used as appropriate. In all analyses a two-sided $P$ value $< 0.05$ was considered statistically significant. All presented means are accompanied by their respective standard deviations.

**Results**

**Patient demographics**

Overall, 1311 visits of 1158 patients were included in this study, 477 in 2020 during the COVID-19 pandemic and 834 during the same period in 2019. Patients from both time periods were similar in all demographic characteristics (Table 1). Average age was $48.1 \pm 20.1$ years and $48.9 \pm 21.4$ years old in 2020 and 2019 respectively, and the majority were male in both time periods (60.58% in 2020 and 56% in 2019).

**Table 1**

Demographic characteristics of study participants

| Variable                      | March-April 2019 | March-April 2020 | p Value |
|-------------------------------|------------------|------------------|---------|
| Number of eyes                | 834              | 477              |         |
| Age, years mean (SD)          | 48.8 (21.36)     | 48.1 (20.1)      | $p = 0.54$ |
| Male n (%)*                   | 467 (56%)        | 289 (60.58%)     | $p = 0.1$ |
| Ethnicity n (%)               |                  |                  | $p = 0.96$ |
| Jewish                        | 694 (83.2%)      | 397 (83.2%)      |         |
| Arab                          | 130 (15.5%)      | 75 (15.7%)       |         |
| Other                         | 10 (1.1%)        | 5 (1%)           |         |
| Distance from hospital, Km    |                  |                  |         |
| Mean (SD)                     | 14.8 (16.7)      | 19.2 (26.3)      | $P = 0.005$ |
| Median (IQR)                  | 11.9 (17.3)      | 13.5 (16.9)      |         |

Abbreviations: IQR- interquartile range, SD-standard deviation, Km-kilometer. * Percentage calculated from total visits.
On average, patients drove further from their home to the OER in 2020: $19.2 \pm 26.3$ km versus $14.8 \pm 16.7$ (p < 0.001). This was significant even when patients who came from over 100 kilometers were excluded. The distribution of patients by age is presented in Fig. 1.

**Visit characteristics**

The proportion of follow-up visits was higher (p < 0.001) in 2020 as compared to 2019. The time of day patients arrived at the emergency department differed between the two time periods (Fig. 2) as patients were more likely to arrive in the morning hours in 2020 (p = 0.002). The time from onset of symptoms to the visit was similar between the periods. Table 2 shows visit characteristics for both groups.
Table 2
Visit characteristics

| Variable                                      | March-April 2019 | March-April 2020 | P Value   |
|-----------------------------------------------|------------------|------------------|-----------|
| Referral n (%)                                |                  |                  |           |
| Optometrist                                   | 1 (0.12%)        | 0 (0%)           | p = 0.958 |
| Primary care ophthalmologist                  | 111 (13.3%)      | 63 (13.2%)       | p = 0.958 |
| Primary care non-ophthalmologist              | 232 (27.8%)      | 98 (20.5%)       | p = 0.004 |
| In hospital consult                           | 68 (8.1%)        | 26 (5.4%)        | p = 0.068 |
| Self-referral                                 | 381 (45.7%)      | 196 (41.1%)      | p = 0.126 |
| Follow up to prior visit at our clinic        | 41 (4.9%)        | 94 (19.7%)       | p < 0.001 |
| Trauma n (%)                                  |                  |                  |           |
| No trauma                                     | 676 (81%)        | 405 (85%)        | p = 0.001 |
| Indoor trauma                                 | 52 (6.2%)        | 15 (3.1%)        | p = 0.015 |
| Outdoor trauma                                | 106 (12.7%)      | 56 (11.7%)       | p = 0.608 |
| Eye n (%)                                      |                  |                  | p = 0.163 |
| OD/OS                                         | 701 (85.5%)      | 420 (88.2%)      |           |
| OU                                            | 119 (14.5%)      | 56 (11.7%)       |           |
| Complaint duration, days mean (SD)            | 3.9 (7.8)        | 4.5 (7.8)        | p = 0.22  |
| Chief complaint n (%)                          |                  |                  |           |
| Reduction in vision monocular                 | 83 (9.9%)        | 77 (16.1%)       | p = 0.001 |
| Reduction in vision binocular                 | 18 (2.2%)        | 8 (1.7%)         | p = 0.682 |
| Diplopia                                      | 13 (1.6%)        | 2 (0.4%)         | p = 0.102 |
| Floater                                       | 87 (10.4%)       | 26 (5.4%)        | p = 0.002 |

Abbreviations SD-standard deviation.
| Variable                        | March-April 2019 | March-April 2020 | P Value |
|--------------------------------|------------------|------------------|---------|
| Other visual disturbance       | 18 (2.1%)        | 27 (5.6%)        | p = 0.001 |
| Lid related                    | 64 (7.7%)        | 23 (4.8%)        | p = 0.045 |
| Ocular pain monocular          | 395 (47%)        | 228 (47.8%)      | p = 0.895 |
| Ocular pain binocular          | 46 (5.52%)       | 18 (3.8%)        | p = 0.183 |
| Red eye                        | 71 (8.5%)        | 31 (6.5%)        | p = 0.188 |
| Other                          | 56 (7%)          | 52 (11%)         | p = 0.008 |

Abbreviations SD-standard deviation.

Ophthalmologic examination and clinical findings

In 2020, visual acuity at presentation in the eye which was the reason for the visit was worse than in 2019 (0.42 ± 0.6 logMAR (20/52) vs. 0.34 ± 0.5 logMAR (20/43), p = 0.025) and there was a higher chance of involvement of both segments compared to 2019 (4.82% versus 1.2%, p < 0.001). Clinical findings in both time periods are shown in Table 3.
Table 3
Ophthalmologic examination and clinical findings

| Variable                      | March-April 2019 | March-April 2020 | P Value |
|-------------------------------|------------------|------------------|---------|
| LogMar VA mean (SD)           |                  |                  |         |
| CC eye                        | 0.34 (0.5)       | 0.42 (0.6)       | p = 0.025 |
| Fellow eye                    | 0.26 (0.4)       | 0.23 (0.4)       | p = 0.23 |
| IOP, mmHg mean (SD)           |                  |                  |         |
| OD                            | 13.94 (4.6)      | 14.8 (5.7)       | p = 0.065 |
| OS                            | 14.14 (4)        | 13.96 (5.9)      | p = 0.683 |
| Eye segment involved          |                  |                  |         |
| Anterior chamber              | 572 (68.6%)      | 319 (66.9%)      | p = 0.524 |
| Posterior chamber             | 159 (19%)        | 91 (19%)         | p = 0.995 |
| Both                          | 10 (1.2%)        | 23 (4.8%)        | p < 0.001 |
| None                          | 93 (11.1%)       | 43 (9%)          | p = 0.372 |
| Main clinical finding         |                  |                  |         |
| Normal examination            | 85 (10.2%)       | 45 (9.4%)        | p = 0.659 |
| Foreign body                  | 108 (12.9%)      | 74 (15.5%)       | p = 0.196 |
| Conjunctivitis                | 72 (8.6%)        | 24 (5%)          | p = 0.016 |
| Retinal Vascular event        | 11 (1.3%)        | 9 (1.9%)         | p = 0.484 |
| Retinal tear                  | 24 (2.9%)        | 13 (2.7%)        | p = 0.873 |
| Retinal Detachment            | 10 (1.1%)        | 8 (1.7%)         | p = 0.474 |
| Perforation                   | 3 (0.3%)         | 0                |         |
| Neuro ophthalmology           | 19 (2.3%)        | 16 (3.3%)        | p = 0.245 |

Abbreviations: SPK- superficial punctate keratitis, PVD- posterior vitreos detachment, SCH-subconjunctival hemorrhage, VH-vitreous hemorrhage, SD-standard deviation.
| Variable                          | March-April 2019 | March-April 2020 | P Value |
|----------------------------------|------------------|------------------|---------|
| Anterior segment inflammation    | 23 (2.7%)        | 14 (2.9%)        | p = 0.852 |
| Posterior segment inflammation   | 1 (0.1%)         | 0                |         |
| Glaucoma                         | 12 (1.4%)        | 19 (4%)          | p = 0.004 |
| Dry eye                          | 37 (4.4%)        | 17 (3.6%)        | p = 0.444 |
| Corneal laceration               | 85 (10.2%)       | 54 (11.3%)       | p = 0.523 |
| Conjunctival laceration          | 13 (1.5%)        | 8 (1.7%)         | p = 0.87 |
| SPK                              | 66 (7.9%)        | 30 (6.3%)        | p = 0.277 |
| Chalazion                        | 14 (1.7%)        | 9 (1.9%)         | p = 0.828 |
| PVD                              | 62 (7.4%)        | 21 (4.4%)        | p = 0.03  |
| Lid swelling                     | 43 (5.1%)        | 22 (4.6%)        | p = 0.663 |
| SCH                              | 31 (3.7%)        | 14 (2.9%)        | p = 0.53  |
| Corneal abscess                  | 36 (4.3%)        | 40 (8.4%)        | p = 0.002 |
| Blepharitis                      | 21 (2.5%)        | 6 (1.2%)         | p = 0.157 |
| Retinopathy                      | 10 (1.2%)        | 10 (2.1%)        | p = 0.242 |
| VH                               | 14 (1.7%)        | 13 (2.7%)        | p = 0.227 |
| other                            | 59 (7.1%)        | 58 (12.1%)       | p = 0.002 |
| Number of diagnoses              | 0.93 (0.35)      | 1.0 (0.5)        | p = 0.001 |
| mean (SD)                        |                  |                  |         |
| One diagnosis n (%)              | 724 (86.8%)      | 388 (81.3%)      | p = 0.008 |
| Two diagnoses and more n (%)     | 25 (3%)          | 43 (9%)          | p < 0.001 |

Abbreviations: SPK- superficial punctate keratitis, PVD- posterior vitreous detachment, SCH- subconjunctival hemorrhage, VH- vitreous hemorrhage, SD-standard deviation.

In 2020, more diagnoses were given to each patient – 43 (9%) patients in 2020 and 25 (3%) patients in 2019 received two or more diagnoses (p < 0.001, Table 3). Patients were given one of 24 different Ophthalmic diagnoses. The chief complaint was bilateral in 11.7% (n = 56) and 14.5% (n = 119) in 2020.
and 2019, respectively (P = 0.195). Conjunctivitis and posterior vitreous detachment (PVD) were significantly less likely to occur in 2020 as compared to 2019 (5% vs. 8.6%, p = 0.016 for conjunctivitis and 4.4% vs. 7.4%, p = 0.03 for PVD). A diagnosis of glaucoma (4% vs. 1.4%, p = 0.04) and corneal abscess (8.4% vs. 4.3%, p < 0.001) were more common in 2020 as compared to 2019. The proportion of visits resulting from trauma was lower in 2020 (72 (15%) in 2020 and 167 (19%), p = 0.001). This was true when indoor trauma was assessed separately as well (p = 0.015). Visits due to floaters (p = 0.002) and lid related complaints (p = 0.045) were more likely to occur in 2019.

Case Management

Table 4 shows management patterns in both periods. In 2020, the percentage of patients who were discharged without receiving any treatment was lower than in 2019 (23.26% versus 29.25%, respectively, p = 0.003). Specifically, topical antibiotics, topical steroids, systemic steroids, hypotensive drops, and artificial tears were all prescribed more in 2020 (p < 0.005 for all). Two or more medications were prescribed to 151 (31.6%) patients in 2020, and to 97 (11.6%) patients in 2019.
Table 4
Case Management

| Variable                  | March-April 2019 | March-April 2020 | P Value |
|---------------------------|------------------|------------------|---------|
| Treatment                 |                  |                  |         |
| n (%)                     |                  |                  |         |
| No treatment              | 244 (29.2%)      | 104 (23.2%)      | \( p = 0.003 \) |
| Topical antibiotics       | 331 (39.7%)      | 227 (47.6%)      | \( p = 0.005 \) |
| Topical steroids          | 88 (10.5%)       | 97 (20.3%)       | \( p < 0.001 \) |
| Lubrication               | 187 (22.2%)      | 143 (30%)        | \( p = 0.003 \) |
| Systemic antibiotics      | 47 (5.6%)        | 22 (4.6%)        | \( p = 0.425 \) |
| Systemic steroids         | 4 (0.47%)        | 10 (2.1%)        | \( p = 0.01 \) |
| Intravitreal injections   | 19 (2.3%)        | 12 (2.5%)        | \( p = 0.851 \) |
| Glaucoma treatment        | 14 (1.7%)        | 28 (5.9%)        | \( p < 0.001 \) |
| Other                     | 12 (1.4%)        | 41 (8.6%)        | \( p < 0.001 \) |
| Number of treatments mean (SD) | 0.84 (0.67) | 1.22 (0.95) | \( p < 0.001 \) |
| One treatment             | 493 (59.1%)      | 221 (46.3%)      | \( p < 0.001 \) |
| n (%)                     |                  |                  |         |
| Two or more treatments    | 97 (11.6%)       | 151 (31.6%)      | \( p < 0.001 \) |
| n (%)                     |                  |                  |         |
| Auxiliary tests           |                  |                  |         |
| n (%)                     |                  |                  |         |
| No Auxiliary tests        | 751 (90%)        | 388 (81.3%)      | \( p < 0.001 \) |
| OCT                       | 64 (7.7%)        | 62 (12.3%)       | \( p = 0.002 \) |
| Visual fields             | 20 (2.4%)        | 16 (3.3%)        | \( p = 0.38 \) |
| FA                        | 6 (0.7%)         | 13 (2.7%)        | \( p = 0.006 \) |
| US                        | 8 (0.9%)         | 14 (2.9%)        | \( p = 0.012 \) |

Abbreviations: OCT- optical coherence tomography, FA- fluorescein angiography, US- ultrasound, SD - standard deviation.
### Auxiliary tests

A summary of auxiliary tests performed in March-April 2019 and March-April 2020 is provided in the table below. The table includes the number of auxiliary tests performed, mean and standard deviation for certain variables, and the p-value for the comparison between the two time periods.

| Variable                                | March-April 2019 | March-April 2020 | P Value |
|-----------------------------------------|------------------|------------------|---------|
| Number of Auxiliary tests mean (SD)     | 1.02 (0.16)      | 1.06 (0.3)       | p < 0.001 |
| Office procedures                       |                  |                  |         |
| n (%)                                   |                  |                  |         |
| No office procedures                    | 673 (80.7%)      | 368 (77.1%)      | p = 0.127 |
| Foreign body removal cornea             | 63 (7.5%)        | 58 (12.2%)       | p = 0.008 |
| Foreign body removal conjunctiva        | 47 (5.6%)        | 17 (3.6%)        | p = 0.094 |
| Laser Barrage                           | 22 (2.6%)        | 15 (3.1%)        | p = 0.594 |
| Washing                                 | 19 (2.3%)        | 6 (1.2%)         | p = 0.311 |
| Hospitalizations                        | 28 (3.3%)        | 9 (1.9%)         | p = 0.165 |
| Follow up location                      |                  |                  |         |
| n (%)                                   |                  |                  |         |
| Hospital                                | 254 (30.4%)      | 222 (46.5%)      | p < 0.001 |
| Outside clinic                          | 403 (48.3%)      | 169 (35.4%)      | p < 0.001 |
| None                                    | 177 (21.2%)      | 85 (17.8%)       | p = 0.154 |
| Number of emergent surgeries           | 15 (1.8%)        | 18 (3.8%)        | p = 0.042 |
| Time from diagnosis to surgery, days    | 2.86 (1.91)      | 2.23 (1.95)      | p = 0.364 |
| mean (SD)                               |                  |                  |         |
| Number of in hospital consults          | 16 (1.9%)        | 14 (2.9%)        | p = 0.236 |

Abbreviations: OCT- optical coherence tomography, FA- fluorescein angiography, US- ultrasound, SD - standard deviation.

Auxiliary testing was performed more frequently in 2020 as compared to 2019. Statistically significant differences were found in the use of optical coherence tomography (OCT, 12.3% vs 7.7%, p = 0.002), fluorescein angiography (FA, 2.7% vs 0.7%, p = 0.006) and Ultrasound B-scan (2.9% vs 0.9%, p = 0.012). Removal of corneal foreign body was more likely in 2020 (12.2% vs 7.5%, p = 0.008), while other slit lamp procedures were performed at similar rates in both time periods.
There was no difference in the number of hospitalizations (9 (1.9%) in 2020 and 28 (3.3%) in 2019, p = 0.165). Follow up visits were more likely to be scheduled for the hospital clinic in 2020, as oppose to a referral back to the community (46.5% vs 30.4%, p < 0.001).

The number of emergent surgeries was higher in 2020 [3.8% (n = 18) vs. 1.8% (n = 15), p = 0.024].

**Discussion**

The aim of this study was to characterize visits to the OER during the COVID-19 pandemic when the country was under government-mandated quarantine, and to assess its effect on management strategies to aid healthcare resource management.

We found that the number of OER visits during the COVID-19 pandemic was reduced by 43% as compared to the same month the previous year. Since non-urgent visits make up to three quarters of OER visits in normal times [7], the reduction in visit numbers during the pandemic is likely due to patient's higher threshold for seeking medical care. It should be noted that sight-threatening emergencies do occur in patients who are reluctant to leave the house and seek care. For these patients and for at-risk populations in general, measures should be implemented to allow for phone-based triage and telemedicine. Although the number of visits was significantly reduced during the pandemic, the age of the patients remained unchanged. This finding was unexpected in the context of the COVID-19 pandemic, as the strictest limitations were upon patients over the age of 65 since morbidity and mortality from the virus was higher in this group.

On average, patients travelled a longer distance on average to arrive at the OER during the COVID-19 pandemic as compared to the previous year in this study. This finding remained significant when patients who came from over 100 kilometers were excluded. This is in keeping with the finding of a higher rate of serious ocular conditions in 2020.

Visits to the OER during the COVID-19 pandemic were due to more serious medical issues as compared to visits from the previous year. This was evident by a worse visual acuity at presentation, a higher rate of monocular reduction in vision as the presenting symptom, a higher rate of involvement of both segments of the eye, a higher rate of emergent surgeries and a higher rate of multiple diagnoses. This finding is likely due to a higher threshold for seeking ophthalmic care. Also, topical antibiotics, topical and systemic steroids and hypotensive drops were all prescribed more in 2020 as compared to 2019. A study from Taiwan [8] found that VA could be an indicator for determining the priority and time of ocular emergencies requiring ophthalmic intervention in patients visiting the ED for eye-related reasons. A LogMAR VA score of 0.45 (decimal equivalent of 0.4) had the highest discrimination power for identifying whether a patient needed ophthalmology intervention or admission to an ophthalmology ward. Our results of VA in 2020 (LogMAR 0.42) correspond to the score that Kang, E.Y., et al found to correlate with more severe ophthalmic emergencies.
OER visits in 2020 were less likely to be related to trauma as compared to 2019. This can be explained by the lifestyle modifications made necessary by the quarantine. There was no difference in outdoor trauma in our study. Interestingly, the percentage of visits due to indoor trauma did not increase, despite the home quarantine. The lower incidence of trauma related visits during the COVID-19 pandemic in our study is consistent with the recent report by Pellegrini et al. from Italy [9]. However, Pellegrini et al. did find an increase in indoor trauma.

We found that the time from onset of symptoms to the OER visit did not differ between the two periods. OER visits were significantly more likely to occur in the morning in 2020, and the rate of nighttime visits was reduced. This is probably a reflection of altered working schedules due to the quarantine.

Wu et al. [10] reported that one third of COVID-19 positive patients had ocular manifestations consistent with conjunctivitis. Interestingly, Gangaputra et al. [11] reported that among patients tested for COVID-19, red eye and epiphora were significantly more common in the COVID-19 negative group. Our cohort of ambulatory patients during 2020 were less likely to be diagnosed with conjunctivitis. This is possibly due to the community-based spread of this disease, which is likely blunted by social distancing and quarantine. Diagnoses which have been linked to stress (like central serous chorio-retinopathy or blepharitis and chalazion, [12–14]) were not more likely to occur in 2020 in our study.

Different epidemiological reports tried to characterize the magnitude and patterns of visits to the OER. Their results are comparable to our 2019 findings. Docherty et al. [15] analyzed data from emergency ophthalmology referrals in 2017 and found that PVD (12.2%) was the most common diagnosis, followed by corneal abrasion (7.4%) and retinal detachment (5.3%). Our results from 2019 showed 7.4%, 10.2%, 1.1% of PVD, corneal abrasion and Retinal Detachment (RD) respectively. The differences are minor and are likely explained by different referral patterns between the studies. Channa et al. reported corneal abrasions (13.7%) and foreign body in the external eye (7.5%) as the leading diagnoses in the emergent category, and conjunctivitis (28.0%), subconjunctival hemorrhages (SCH) (3.0%), and styes (3.8%) were the leading diagnoses in the non-emergent category in 2015 in the United States [16]. In 2019, we found comparable rates of foreign bodies (12.9%), corneal abrasions (10.2%), SCH (3.7%) and Chalazion (1.7%).

We found that OCT, FA and ultrasound B-scan were all performed more frequently in 2020 as compared to 2019. The location of follow-up in 2020 was more likely to be in the hospital, and not in the outside clinic. These findings are likely related to the higher rate of serious ocular conditions, to the limited availability of community-based eye care during the pandemic, or alternately to the tendency of the treating physician to try and avoid follow up visits as much as possible. There were 18 Surgeries in 2020, and 15 in 2019. This corresponds to the higher threshold of patients to arrive with non-urgent issues. However, it is important to note that visits to the OER in 2020 were more likely to result in surgery as compared to the year before.

This study has several limitations: First, medical care was given by at least 10 different Ophthalmologists working in our facility, though this was true for both time periods. However, it expresses the real-life
working patterns. Second, is the retrospective nature of the study with its inherent limitations in data collection and interpretation. Third is the limited duration of testing, with one month possibly underrepresenting some less common diagnoses. Fourth, since less patients arrived during 2020, some of the statistically significant comparisons were based on percentage and not the absolute numbers. Since the demographic distribution was similar between the years, we believe that this limitation is part of the conclusions of our study.

In summary, OER visits during the pandemic tended to be for more severe ocular conditions and required more testing as well as more medical and surgical treatment. While there were less frequent visit during the COVID-19 pandemic, as compared to the previous year, the demographics of the patients remained unchanged. This data should be considered when planning for future scenarios that share similarities to this one.

Declarations

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The authors have declared that no competing interests exist. None of the authors has a potential source of conflict of interest - financial or otherwise that might be perceived as influencing an author's objectivity.

Availability of data and material -

Not applicable

Code availability -

Not applicable

Authors' contributions –

All authors whose names appear on the submission made substantial contributions to the research.

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**Figures**
Figure 1

The distribution of patients by age; Inner circle 2019, outer circle 2020. No statistical difference was found between the age groups.
Figure 2

The time of day patients arrived at the emergency department; Inner circle 2019, outer circle 2020. Patients were more likely to arrive in the morning hours (6AM-12PM) in 2020 (P=0.002*).