

Immediate impact of COVID-19 on eye banking in India

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Purpose: In India, COVID-19 infected more than 10 million and caused more than 148,000 fatalities during 2020. Due to “lockdown” eye banks were shuttered in March, 2020 and reopened for operations in the month of May, 2020. This study assesses the immediate impact of the pandemic on eye banking and cornea transplantation in India. **Methods:** Data was gathered through an online survey of the eye banks and cornea surgeons in India. The questionnaire collected information on the vital statistics of eye bank operations and cornea transplants for the period from March to June for the years 2019 and 2020. **Results:** 47 eye banks responded to the survey. Collectively in the March–May 2020 period, corneas collected and transplanted declined by 78.27% and 79.14%, respectively, compared to the same period of 2019. In June 2020, the first full month after operations restarted, the collection and transplants were respectively, 82.10% and 81.82%, lower than June, 2019. Long-term glycerine preservation of corneas in the period from March to June 2020 increased by 124.5% compared to same period in 2019, but overall only 5.26% of the corneas recovered were preserved in this way. 44.44% of the eye banks collected corneas only from donors with negative COVID-19 diagnosis. 36.11% of the respondents rejected all suspicious cases, such as donors with respiratory pathologies, and 2.78% of the respondents accepted donations from medico legal cases only. 19.44% of the responding eye banks did SARS-CoV-2 nasal swab test for the deceased donor. 79.5% of the eye banks reported that staff were willing to work during the pandemic, and 82.05% eye banks gave special training to staff before restarting services. **Conclusion:** Due to the steep decline in collections and transplants, 2020 can be termed as a lost year in Indian eye banking. Attention to Hospital Cornea Recovery Programs, continuous situation monitoring, and ongoing staff training programs are recommended.

Key words: Cornea transplants, COVID-19, eye bank, eye banking, immediate, impact, ophthalmology, pandemic

On March 11, 2020, the World Health Organization (WHO) declared that COVID-19 caused by the 2019 novel coronavirus (2019-nCoV) has become a pandemic.^[1] By the end of 2020, there were more than 84 million confirmed cases, and 1.8 million deaths reported globally.^[2] In India, from Jan 3, 2020 to December 31, 2020 there were 10,266,674 confirmed cases of COVID-19 and 148,738 mortalities from COVID-19.^[2]

On March 24, 2020, a nationwide lockdown was ordered by the Government of India for 21 days, which was subsequently extended in phased manner. All the non-essential services were suspended during the lockdown.^[3] The Eye Bank Association of India (EBAI) in its communication to all EBAI members, advised to halt Eye Banking Services including retrieval, processing, and transportation of corneas. The guidelines for the functioning of eye care facilities under National Programme for Control

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of Blindness and Visual Impairment (NPCB and VI) by the Ministry of Health and Family Welfare (MoHFW), Government of India issued on 8th May 2020, allowed for Hospital Cornea Retrieval Program (HCRP) to cater to the need of corneas for therapeutic purposes. Collecting corneas only from deceased patients not diagnosed with COVID-19 was allowed.^[4]

The potential risk of COVID-19 transmission to eye recovery and evaluation technicians during cornea recovery, processing and evaluation, and the risk of transmission of the infection to the patient through the transplanted cornea, were a significant concern for all eye banking professionals. Eye Bank Association of India (EBAI) in association with All India Ophthalmological Society (AIOS), Cornea Society of India (CSI), Indian Society of Cornea and Keratorefractive Surgeons (ISCKRS), and MoHFW issued guidelines on May 11, 2020 to provide guidance for restarting the eye bank services in India.^[5]

Assessment of the impact of the early days of the pandemic on eye banking and cornea transplantation is needed so as to

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effectively determine the future course of action. This paper summarizes the results of a detailed survey on the impact of COVID-19 on eye banking in India. The survey also highlights the criteria used by the eye banks to restrict the number of donors and to avoid collecting corneas from donors who had SARS-CoV-2 infection. Additionally, the survey assessed the eye bank staff's willingness to work during the ongoing pandemic. By bringing relevant data points together, this survey provides a benchmark for assessing the early impact of the pandemic and to understand the recovery trajectory.

Methods

An online survey (through Google Forms) on "Impact of COVID-19 on Eye Banking and Corneal Surgery" was conducted among the Eye Banks and Cornea Surgeons from the pool of members of the All India Ophthalmological Society (AIOS) and the Eye Bank Association of India (EBAI). The survey was designed to understand eye banking and cornea surgery trends at the wake of the pandemic. The questionnaire included 40 questions. There was a provision to skip a question without choosing any of the response options. Prior to submitting the survey response, the respondents could modify their responses as many times as they wished. However, once submitted, there was no opportunity to change the responses.

The survey was sent via email to 16,000 ophthalmologists across India on their email addresses registered with AIOS and 1200 Institutional and Individual members of EBAI. The email contained the weblink to the web-based questionnaire. The questionnaire was built using Google Forms with secure, confidential access. The email explained the study goals and provided instructions for answering the survey. The individual identity of the respondents was kept anonymous and secure.

The survey was emailed to the target participants on July 14, 2020 and the response collected was cut-off at mid-night of September 16, 2020. Collected information was tabulated and analyzed using spreadsheets (Microsoft Excel version 2016). The research was conducted adhering to the tenets of the Declaration of Helsinki.

Results

A total of 47 responses were obtained from July 14, 2020 to the midnight of September 16, 2020. We specifically looked at the 4 months' time-window starting from the beginning of March till the end of June, since this period marked the large scale onset of the pandemic in India and covered the initial lockdown and subsequent reopening. The key attributes were compared between this period and the same period of 2019.

Collection of corneas

Data on collection and utilization of corneas as submitted by the survey respondents is summarized in Fig. 1. In the period from March 1, 2020 to May 31, 2020 total number of donor corneas collected was 1,898. During the same period in 2019, 8,735 corneas were collected. Thus collection during this period in 2020 was 78.27% lower than that during the same period in the last year. The collection in the month of June 2020 was 193 corneas, which is 82.10% lower when compared to the June 2019 collection of 2,987 corneas. In Table 1, the respondents are grouped by volume of corneas they collected

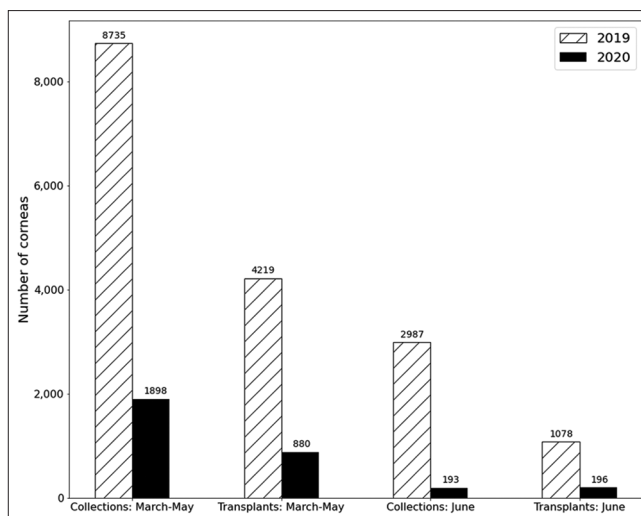


Figure 1: Cornea Collection and Utilization for Transplants: 2020 versus 2019

Table 1: Impact of COVID-19 on cornea collections (aggregated by organizations of various sizes as per volume of collections in March 2019-June 2019 period)

Number of corneas collected in March 2019-June 2019 period	Decrease in collection in March 2020-June 2020 period compared with March 2019-June 2019 period
More than 1000	81.45%
From 501-1000	83.96%
From 101-500	80.64%
Upto 100	74.91%

in March 2019–June 2019 period. This gives an indication of the impact across organizations of various sizes. In aggregate, organizations that are in the smallest size bracket (did upto 100 collections in March–June, 2019) saw their collections dip by about 75%. For organizations in higher size brackets collections decreased in aggregate by more than 80%.

Utilization of corneas

In the period from March 1, 2020 to May 31, 2020, total number of donor corneas utilized for transplants was 880. During the same period in 2019, 4,219 corneas were transplanted. Thus, the utilization of corneas in this period was 79.14% lower than the utilization during the same period in 2019. The utilization in June 2020 was 196 transplants, which is 81.82% lower when compared to the 1078 transplants done in June 2019.

Utilization Rate of corneas

The Utilization Rate of the corneas (i.e., total no. of corneas used for transplants divided by total no. of corneas collected, expressed in percentage) in the period from March 1, 2020 to May 31, 2020 is 46.36%. This is two percentage points lower than the Utilization Rate during the same period in 2019, which was 48.30%. The Utilization Rate of June 2020 is 101.55% as compared to 36.09% achieved in June 2019. Utilization Rate calculated from the responses is summarized in Fig. 2.

Preservative media usage

Table 2 captures summary of the data provided by respondents about preservative media usage. As per survey responses,

Table 2: Preservative media usage as reported by eye bank respondents

Preservative media used and time period	Number of vials	As proportion of the number of corneas recovered in the time period
MK used from March 2020 to June 2020	987	47.20%
Cornisol™ used from March 2020 to June 2020	1035	
Optisol™ used from March 2020 to June 2020	40	
Total Long-term storage media (Cornisol + Optisol)	1075	51.41%
Glycerine/Glycerol used from March 2020 to June 2020	110	5.26%
Glycerine/Glycerol used from March 2019 to June 2019	49	0.56%*

Note: 1. Rightmost columns do not add to 100 for March 2020-June 2020 period. This indicates that some of the recovered cornea were transferred from one media to another. 2. The asterisk (*) indicates that the proportion is with respect to collections in March 2019-June 2019 period

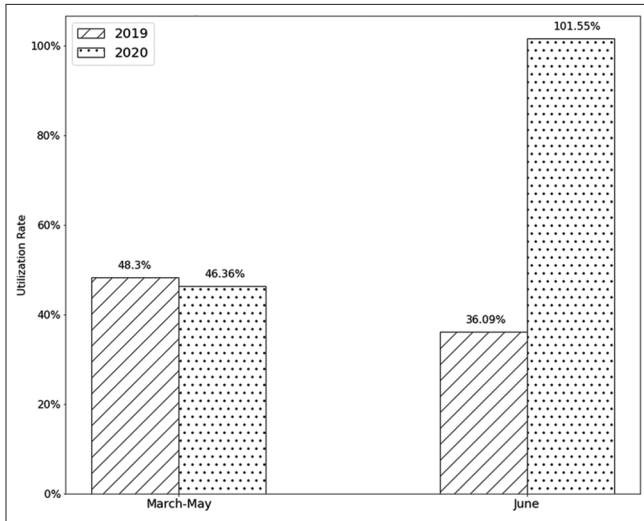


Figure 2: Cornea Utilization Rate: 2020 versus 2019

a total of 987 vials of McCarey-Kaufman (MK) media (short-term storage) were used to preserve corneas in the period from March 1, 2020 to June 30, 2020. During the same period, 1075 vials of intermediate-term storage medium were used. This consisted of 1035 vials of Cornisol™ and 40 vials of Optisol™. For long-term storage, 110 corneas were transferred to glycerine/glycerol during this period. Thus, in the period from March 1, 2020 to June 30, 2020, 51.41% of the corneas were preserved in intermediate-term storage media, 47.20% of corneas were stored in the short-term storage media, and 5.26% were stored in glycerine for long-term purposes. During the same period in 2019, only 49 corneas were transferred to glycerine/glycerol for long-term storage. This indicates a 124.49% increase in glycerin preservation at the onset of the pandemic.

Reaction of Eye Bank Staff to work in the ongoing pandemic

Totally, 39 eye banks responded to question on Eye Bank staff’s disposition on working during the pandemic. The responses are summarized in Fig. 3. About 79.49% of respondents stated that the eye bank staff expressed no reservations in working during the ongoing pandemic. 17.95% of respondents said that the staff showed reservations about working in the ongoing pandemic. 2.56% of respondents said that the staff initially showed reservation but later on started working. Two respondents reported that two frontline staff, one eye bank coordinator, and one eye bank technician voluntarily left the services at the wake of the pandemic.

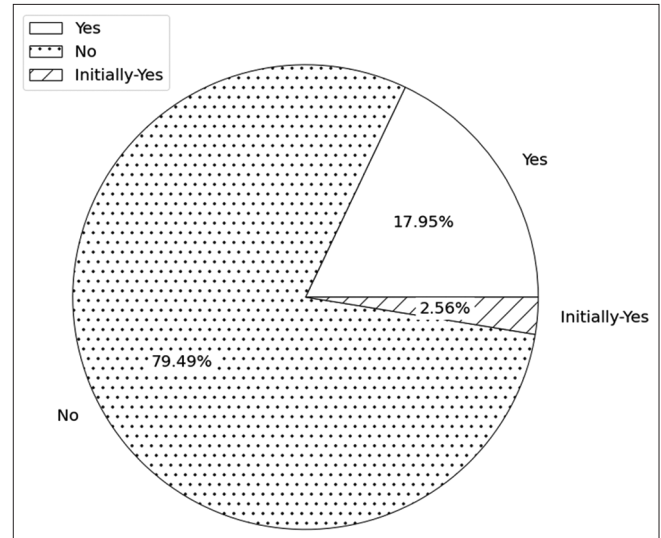


Figure 3: Reservation among Eye Bank Staff about working in the pandemic

Special training of the Eye Bank Staff before restarting the operations

A total of 39 responses were received about special training for staff prior to restarting operations. The responses are summarized in Fig. 4. 82.05% of the respondents claimed to have provided special training to the eye bank staff for restarting the operations, whereas 17.95% of respondents said that no special training was provided to the staff before restarting the operations.

Criteria to restrict the number of donors and avoid collecting SARS-CoV-2 corneas

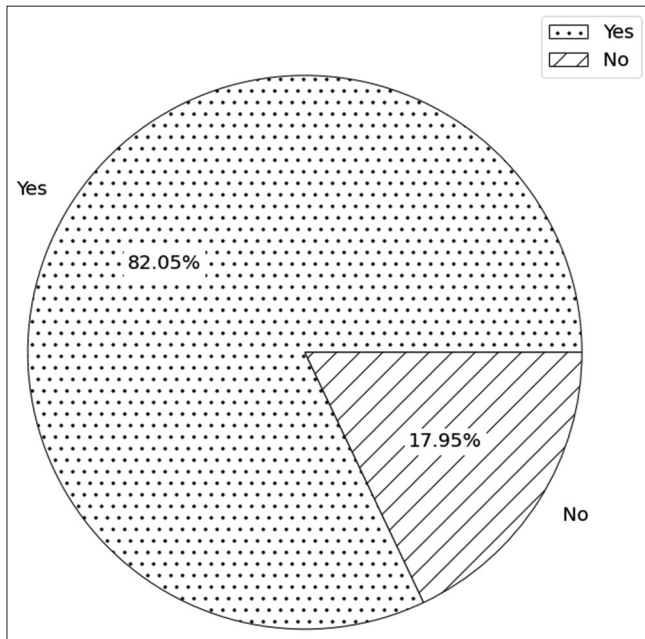
Table 3 summarizes the 36 responses received on criteria to restrict donors and avoid collecting corneas from COVID-19 positive donors. 44.44% of the respondents reported collecting corneas only from donors with negative COVID-19 diagnosis. 36.11% of the respondents stated that they rejected all suspicious cases, such as donors with respiratory pathologies. One (2.78%) of the respondents mentioned that they are following EBAI and AIOS guidelines to collect the corneas and taking only medico legal cases. 16.67% of the responding eye banks were not doing any cornea collection during the period studied.

SARS-CoV-2 nasal swab test for the deceased donor by the eye bank

Fig. 5 summarizes the response of 36 Eye Banks about conducting SARS-CoV-2 nasal swab on donors. 19.44% of the

Table 3: Criteria followed to restrict the number of donors and avoid collecting corneas from SARS-CoV-2 patients

Criteria used to restrict the number of donors and avoid collecting SARS-CoV-2 corneas	Proportion of respondents
Rejected suspicious cases, such as donors with respiratory pathologies	36.11%
Just-procured donors with clear/negative COVID-19 diagnosis	44.44%
Only MLC cases with criteria of EBAI and AIOS	2.78%
No Collection	16.67%

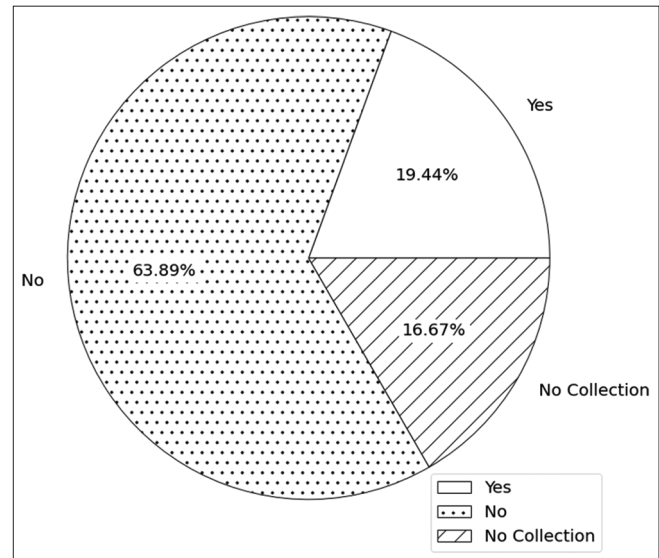
**Figure 4: Proportion of Eye Banks who imparted special training to staff before restarting**

participants reported that the SARS-CoV-2 nasal swab test is done for all the deceased donors, 63.89% of the respondents were not performing the nasal swab test for the donors, and 16.67% of participants reported no collection during the period. None of the respondents who were performing the nasal swab test for the deceased donor reported any positive result for SARS-CoV-2 from the swab test.

Discussion

Our results clearly highlight the dramatic reduction in the volume of cornea collections and transplants in the first 3 months of the pandemic. The eye banks that responded to the survey all together report 79% contraction in eye transplants. More alarmingly recovery to previous levels also appear bleak. This indicates a severe decrease in the number of cornea transplants for the year 2020 and a permanent blow to the goal of addressing avoidable blindness. Decrease in cornea collection and transplantation throughput has been reported from other geographies as well. A national report from Italy shows a 58.42% and 56.23% decrease in cornea retrieval and distribution respectively, in 2020 as compared to 2019.^[6]

Voluntary donations contribute the bulk of corneas donated and recovered in India.^[7] This has been hit the hardest by the onset of COVID-19. In our experience,

**Figure 5: Proportion of Eye Banks performing SARS-CoV-2 nasal swab test on the donor**

Eye Donation Centers, which have a high dependence on voluntary donations, will practically be rendered inactive given the situation. However, caution in donor selection is well warranted. Indeed, a study by D'Souza *et al.*^[8] reveals that nasal swabs from 14% of voluntary corneal tissue donors without a prior history of symptoms, signs, or diagnosis of illness suggestive of COVID-19 tested positive for it during post-retrieval testing.

However, we also note the opportunity that the situation has provided for HCRP. In fact, this experience makes a case for further strengthening HCRP. Going forward, consideration can be given for mandatorily notifying all deaths at major hospitals to registered eye banks. Arrival of dead bodies at mortuaries should also be notified to registered eye banks.

The large-scale usage of intermediate-term storage media (Cornisol™ Optisol™) over short-time storage media, that is MK, points towards increasing maturity of Indian eye banking. The spurt in long-term preservative media (Glycerine) usage (124.5% increase in the studied period) provokes us to ponder whether eye banks should always maintain a certain volume of tissues stored in long-term media. A recent report of 49 therapeutic keratoplasties done using glycerol-preserved cornea during the COVID-19 pandemic points towards reliable therapeutic outcomes in the short and interim postoperative period.^[9] Thus, this is an effective way of mitigating unseen disruptions in cornea supply and can help continue emergency cornea transplant surgeries even if other transplants have to be stopped.

By the end of the survey period, all the eye banks who responded had already restarted operations. Acharya *et al.*^[10] have published a good framework for comprehensive operating protocols for restarting eye bank services. Though 82% of the eye banks in our survey provided additional training to staff before resuming operations, the 18% gap does bother us. This isn't a normal scenario. Therefore, rigorous training of staff to ensure their own, as well as other's safety, has to be a priority. Moreover, such training should be repeated at specific intervals.

Conclusion

We have presented a quantitative summary of the immediate impact of the COVID-19 pandemic on Indian eye banking and cornea transplantation. In conclusion, we can say that 2020 is a lost year with respect to eradication of cornea blindness. However, HCRP is paving the way to recovery. Taking cue from this, we suggest further strengthening of HCRP on a systematic basis throughout the country. Moreover, eye banks can consider retaining some corneas in long-term preservative media on an ongoing basis, so as to manage supply shocks in future. Finally, it is essential to continuously monitor the situation, have a threat response protocol in place and have ongoing training programs for staff to ensure safety for them and others.

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Conflicts of interest

There are no conflicts of interest.

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