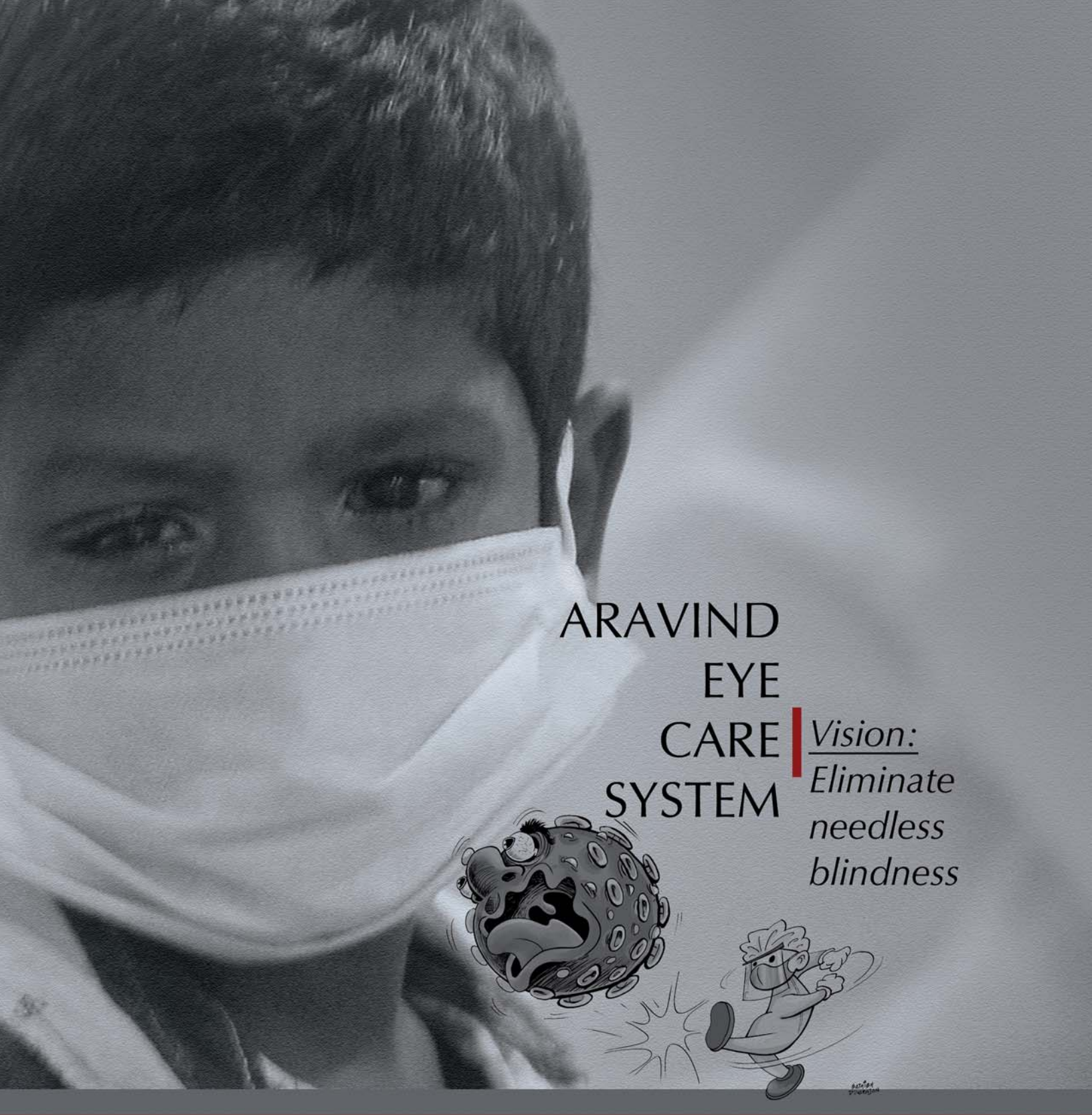


ARAVIND EYE CARE SYSTEM

Vision:
Eliminate needless blindness

activity report

April 2020 to March 2021

. . .

ஒரு கனவை நெய்தவரே,
பெரும் கனலாய் நின்றவரே!
வரும் காலம் கடந்தவரே,
பெரும் வரமாய் வந்தவரே!

You nurtured a dream,
You persisted as a growing flame!
You foresaw beyond the future,
You came as a blessing!

- from 'Oru thuli Velicham', a poem in Tamil
on Dr. V by Prof. Prabahar Vedamanickam

CONTENTS

Photo Credits
Iruthayaraj P, Aravind-Pondicherry
Mohan Raja S, Aravind-Tirunelveli
Rajkumar M, Aravind-Madurai
Ramesh V, Aravind-Madurai
Ramkumar R, Aravind-Pondicherry
Senthil Kumar P, Aravind-Coimbatore
Vijaya Kumar S, Aurolab

activity report

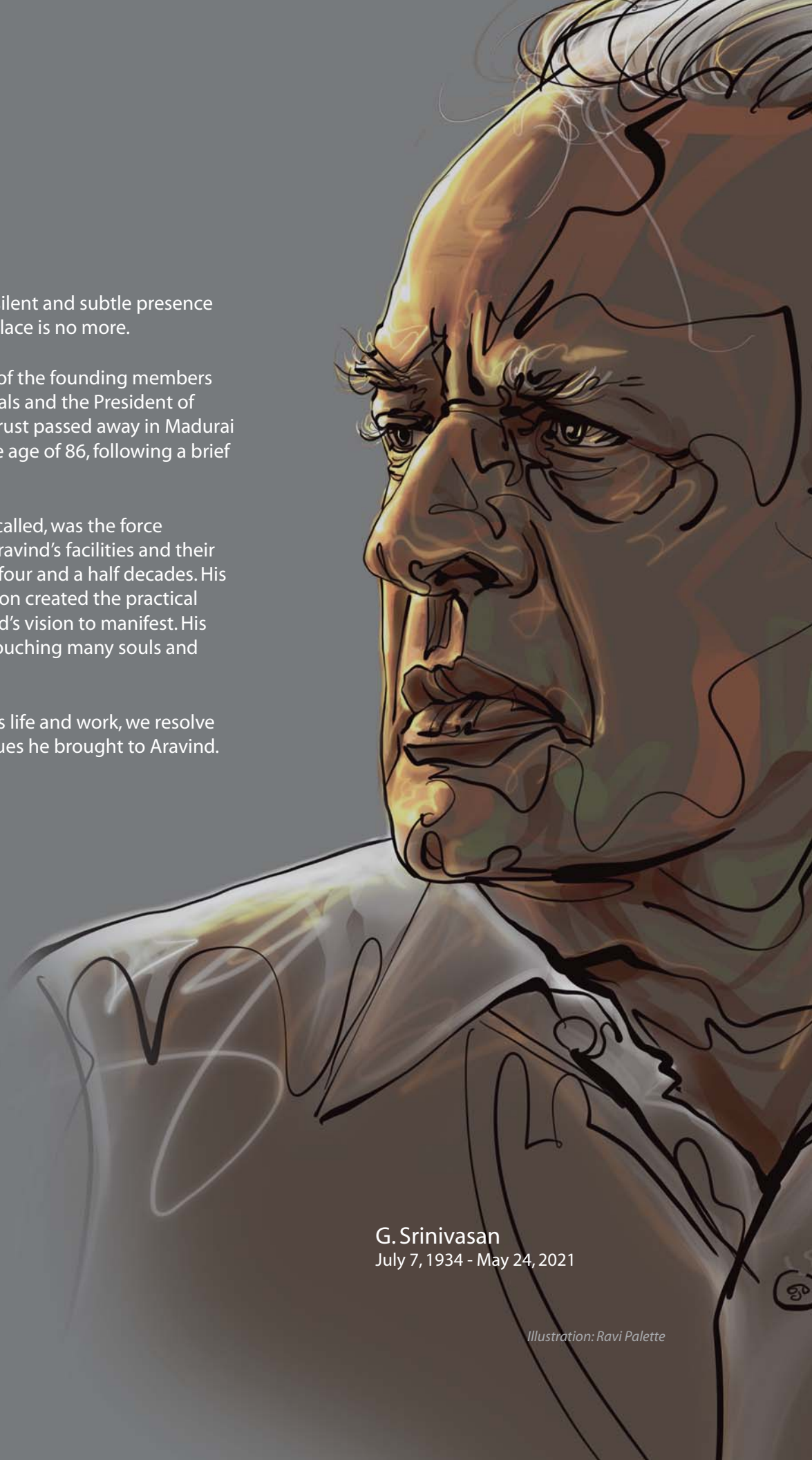
April 2020 to March 2021

The strong pillar, the silent and subtle presence that held Aravind in place is no more.

Mr. G. Srinivasan, one of the founding members of Aravind Eye Hospitals and the President of Aravind's governing trust passed away in Madurai on 24 May 2021 at the age of 86, following a brief period of illness.

'GS' as he was fondly called, was the force behind each one of Aravind's facilities and their growth over the past four and a half decades. His strength and dedication created the practical foundation for Aravind's vision to manifest. His was a life well-lived, touching many souls and lives.

Feeling grateful for his life and work, we resolve to perpetuate the values he brought to Aravind.



G. Srinivasan
July 7, 1934 - May 24, 2021

Illustration: Ravi Palette

ARAVIND EYE CARE SYSTEM

Vision: Eliminate needless blindness..

EYE CARE SERVICES

..by providing compassionate and quality eye care affordable to all

EDUCATION AND TRAINING

..by developing ophthalmic human resources through teaching and training

RESEARCH

..by providing evidence through research and evolving methods to translate existing evidence and knowledge into effective action

CONSULTANCY AND CAPACITY BUILDING

..by enhancing eye care through capacity building, advocacy, research and publications

OPHTHALMIC SUPPLIES AND EQUIPMENT

..by providing trusted and preferred eye care solutions to the world

EYE CARE SERVICES

ARAVIND EYE HOSPITALS

Tertiary Eye Care Centres - 7
(Speciality care, Research & Training)
Madurai 1976
Tirunelveli 1988
Coimbatore 1997
Pondicherry 2003
Salem 2011
Chennai 2017
Tirupati 2019

Secondary Eye Care Centres - 7
(Cataract services, Speciality diagnosis)
Theni 1985
Tirupur 2010
Dindigul 2010
Tuticorin 2012
Udumalpet 2012
Coimbatore City Centre 2014
Kovilpatti 2019

OUTREACH PROGRAMMES

Free Eye Camps

Community Eye Clinics - 6
(Out-patient eye care centres for comprehensive eye examination, treatment of minor ailments)
Melur 2004
Tirumangalam 2005
Cumbum 2008
Madurai City Centre 2009
Sankarankovil 2010
Pondicherry City Centre 2011

Vision Centres - 91
(Primary eye care centres for comprehensive eye examination)

ARAVIND INTEGRATED EYE BANK SERVICES

Madurai
Tirunelveli
Coimbatore
Pondicherry

EDUCATION AND TRAINING

ARAVIND POSTGRADUATE INSTITUTE OF OPHTHALMOLOGY

LIONS ARAVIND INSTITUTE OF COMMUNITY OPHTHALMOLOGY (LAICO)

RESEARCH

ARAVIND MEDICAL RESEARCH FOUNDATION

DR. G. VENKATASWAMY EYE RESEARCH INSTITUTE

Basic and translational research
Clinical research
Operations research
Product development in eye care

CONSULTANCY AND CAPACITY BUILDING

LIONS ARAVIND INSTITUTE OF COMMUNITY OPHTHALMOLOGY (LAICO)

Sharing best practices of Aravind
Advocacy in eye care

OPHTHALMIC SUPPLIES AND EQUIPMENT

AUROLAB

Intraocular lens
Pharmaceuticals
Suture needles
Equipment
Surgical blades
Special products

Highlights

Who would have believed…?

'. . A day will come, we don't know when, but will certainly come when we get a new flu virus which has both the properties – transmissibility like H1N1- swine flu and highly fatal like H5N1-bird flu.

And then we are in big trouble. Then that virus could be around the world in a week. Estimates are that at least 200 million will die. Could be more. Economies will shut down. No one will go to work. And the economic loss will be trillion and trillions of dollars.

And that will be a big catastrophe. The race is on to try and stop that from happening. But at the moment we are completely vulnerable.

We have nothing in place to prevent that from happening right now.'

That's Dr. Richard Feacham, Director, Global Health Group, USA, in his guest lecture to the Aravind staff on December 4th, 2019.

Who would have believed that even as he was predicting the certainty of the pandemic, it had already originated in China…

... and that it will lead to a situation that will bring the entire globe to a complete standstill.

For the first time since inception, Aravind Eye Hospitals closed its doors for routine patient care.

Aravind and the COVID crisis

Providing care while ensuring safety

When the pandemic broke out, there was very little familiarity about the disease. Nation-wide lockdown was announced and there was no clarity on how long it would extend. Added to this, was the uncertainty caused by frequently changing government regulations that had to be complied with.

The main challenge before Aravind was to continue providing care without compromising quality, while ensuring the safety of both staff and patients. Aravind centres during the lock down, attended only to emergency cases. Elective procedures remained suspended during the first few months. Teleconsultation modality was put in place in all base hospitals to cater to patients' urgent eye care needs, as travel was severely restricted.

As lockdown restrictions eased, Aravind resumed its operations in full swing. Adapting to the new-normal, staff and patients quickly mastered the COVID-appropriate behaviour. A set of protocols were developed and strictly adhered to, towards ensuring the safety of staff as well as patients. Staying true to the organisational ethos of sharing

Scheduling system to smoothen the patient flow

as a form of caring, these were disseminated to the wider ophthalmic fraternity through a series of webinars.

Providing care in a safe way during the pandemic required reforming the systems, restructuring the work flow and addressing the challenges that came their way. Scheduling system was put in place to smoothen the patient intake which brought in better resource utilisation, off-setting the capacity reduction brought about by the revised protocols in the context of COVID. This had an added advantage of long waiting hours coming down and increasing the patient satisfaction to a large extent.

LAICO continued to engage with its partner eye hospitals and guided them through online consultations and workshops. In spite of the lock downs, research activities at AMRF went on. The team took turns to work and kept the labs, freezers and essential equipment running. Aurolab played its role by providing personal protective equipment as and when needed, not just to Aravind but also to the wider ophthalmic fraternity, free of cost.

Outreach during the pandemic

Lockdown and the associated restrictions posed a great challenge for outreach activities and Aravind was able to conduct only 440 free eye camps during the year, just about 20% of its usual annual performance. Vision centres, though remained closed for the first two months of lockdown, were quick to rebound and many centres touched 70% capacity in the first week of re-opening. Aravind was also able to open 12 new vision centres.

Inauguration of Namagiripettai vision centre at Aravind-Salem

Move to digital platform for learning and interactions

Adapting to the new-normal, webinars and online sessions became the preferred mode of learning and interactions. Several Aravind centres pioneered online knowledge sharing and learning featuring, national and international speakers of high repute.

One of the flagship events at Aravind, Dr. G. Venkatswamy Memorial Oration and Award ceremony too went online. Aravind honoured Dr. David.F. Chang with the award in recognition of his contributions towards teaching, training, and improving quality and outcomes of cataract care worldwide. Dr. Chang delivered the Dr. G. Venkataswamy Memorial Oration on the topic, *Lessons learnt from the world's greatest team of cataract surgeons.*

Innovations in time of crisis

Aravind put in great effort to cope with the operational challenges brought about by the pandemic and come up with several innovations. Aravind-Pondicherry hosted a hackathon to come up with prototypes of innovative ideas and had participation from across the Aravind centres. Thus, the year saw a spurt of cost-effective, innovations from Aravind Centre for Eye Care Innovations (ACEi) which were rapidly incubated and adopted across the system.

Lockdown Jugaad Series was conducted between May 11-15 by Aravind-Pondicherry to showcase the innovations made to counter the spread of COVID-19 in the hospital setting. Best three innovations were awarded.

Leveraging the downtime to improve systems

Low patient footfall during the pandemic enabled Aravind to introduce and implement new initiatives in the day-to-day operations for efficient care delivery. One major step was the introduction of unified payment interface (UPI) facility in October 2020 and actively promoting the digital payment system. The digital payment system is integrated with Aravind's IHMS software, which makes the transactions easy and safe, as it was contactless. As direct cash handling was not advisable during COVID times, this initiative turned out to be well-timed. There was also an active campaign to create awareness amongst patients to opt for digital payment. As a result of this, since its introduction in October 2020 till March 2021, on an average, digital payment accounted for 41% of the non-credit payments.

Best innovation at the Jugaad series-flexible aerosol x-box by Aravind-Tirupati

Celebrating Perumalda

One of Aravind's greatest contributions to the field of arts was its efforts to recognise the glory and name of A.Perumal, the artist who played a crucial role in the political and art scenario of the country during independence. On December 11, Aravind conducted a virtual event to remember the great artist and his contributions, followed by an exhibition of his art works. Eminent personalities in the field of arts from Madurai and Chennai shared their thoughts about the artist and deliberated on his art works.

Facilitator of the event, Prof. Prabahar Vedamanickam, artists - Ravi Palette and Ramanan with Aravind's Senior leaders at the inauguration

Mr. G. Srinivasan handing over Aravind's contribution to Tamil Nadu Chief Minister's COVID-19 relief fund

An expression of solidarity

Thanks to the whole-hearted support by the staff, Aravind decided to donate one day's salary to help the government in its fight against COVID-19. Aravind was able to contribute substantially to the Chief Minister's COVID Relief Fund in all the three states - Tamil Nadu, Pondicherry and Tirupati in 2020.

Employee engagement

Unusual reduction in patient volumes during lockdown meant that there was work hardly for twenty percent of the work force across the system. As an organisation, Aravind chose to stand by its people at this time of need. The system engaged every employee by sharing responsibility, cross training and multitasking which became a necessity in the rapidly changing scenario. It was decided not to lay off a single staff nor reduce the wages during this period in spite of significantly reduced revenues.

Aravind is grateful to all who are directly working on containing the Corona Virus and in alignment with the values of the organisation, it is also proactively doing what it can to help in this situation.

Aravind-Chennai

Employee engagement activities

Aravind-Coimbatore

Aravind-Udumalpet

Patient Care

As the entire world started getting back to normal, Aravind too resumed its operations partially in May 2020. Only elective procedures were performed in the initial phase; gradually moving on to performing all types of surgeries. It took a long time for Aravind to get back to its usual patient footfall. As lockdown restrictions and fear of COVID-19 resulted in patients postponing hospital visit, there has been a huge backlog of cases. The months of February and March 2021 thus saw a huge surge in patient footfall.

EYE HOSPITALS

Care during COVID-19

Standard protocols to prevent the spread of COVID-19 amongst patients and staff were formulated and implemented across all Aravind Eye Hospitals. All centres stepped-up the safety measures; COVID test was made mandatory for all patients undergoing surgery. Tulsi Chanrai Foundation Eye Hospital, the centre managed by Aravind in Abuja, Nigeria too followed similar protocols to ensure the safety and well-being of both patients and staff.

While tele-consultation had already been in place at Aravind's vision centres, COVID crisis and the resultant lockdown paved way for Aravind's tertiary centres to experiment with it to continue to provide care. Though the service was discontinued post lockdown, Aravind will consider continuing the e-consultation service into the future. Patient scheduling system was experimented in a few centres to make sure that the clinics are not crowded at any point of time.

Quality Council of India has developed a harmonised, standard "Workplace Assessment for Safety and Hygiene (WASH)" to help organisations assess their preparedness to restart after COVID-19 lockdown and run their operations safely. This initiative was to ensure safe operations and workplace for safeguarding the health and safety of employees, customers and the public. The assessment report provided an objective assessment of the safety and hygienic measures undertaken by the applicants to mitigate the risk of COVID-19 infection. Aravind Eye Hospital, Coimbatore became the first hospital in the country to undergo

Safety protocols in place to prevent the spread of COVID-19, Aravind-Coimbatore

assessment and receive certificate. Subsequently, Aravind centres at Pondicherry, Salem, Tirupati and Chennai also underwent the assessment successfully.

NABH accreditation

Ensuring quality at every stage of eye care delivery has always been a priority at Aravind ever since its inception. In the recent years, there is an increasing trend of hospitals applying for NABH quality accreditation. Considering this as an opportunity to enhance the quality and efficiency of care delivery, Aravind centres also applied for NABH accreditation.

Centres at Madurai, Coimbatore, Tirunelveli, Pondicherry, Salem, Udumalpet, Tirupur, Dindigul, Tuticorin and the City Centre at Coimbatore received NABH pre accreditation certification. Aravind-Chennai got full accreditation under ECO standards. Centres at Tirupati and Kovilpatti will apply for accreditation under ECO standards in the coming year. Aravind-Coimbatore had an extensive and strict onsite NABH assessment for eight hours and the hospital came out successfully with no non-compliance.

Infrastructure development

Aravind centres at Coimbatore and Tirunelveli are undergoing significant changes in terms of physical expansion and renovation. Staying true to the principle of "Go green", extreme care and efforts were taken to preserve the trees that came in the way of expansion and relocate them to an appropriate place at Aravind-Tirunelveli. Space constraint has always been an issue at Aravind Eye Hospital, Dindigul and this problem was compounded by the growing number of patients in the recent years. It was a felt need within Aravind

Inauguration of Heidelberg Spectralis OCT at Aravind-Tirunelveli

that the facility be relocated to spacious premises. After much procedural delay, construction of the hospital building and housing quarters was started in October 2020. The work is expected to get over by April 2022. The upcoming facility is located about 1.5km from the existing hospital.

Sri Venkateswara Aravind Eye Hospital, Tirupati has been empanelled to offer services under the Andhra Pradesh Chief Minister's free health care scheme titled, Arogyasri. Retina clinic was inaugurated in its assigned space in the first floor in March 2021 by Dr.V.Narendran, Chief Medical Officer, Aravind-Coimbatore.

To meet the growing demands, Aravind-Theni opened an additional operating room for cataract on October 24.

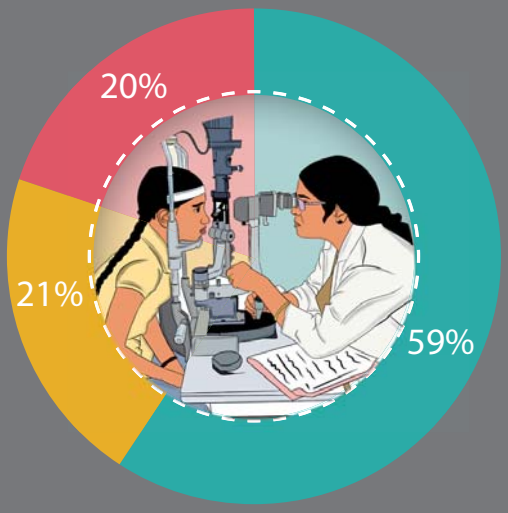
Aravind's Community Eye Clinic at Cumbum was relocated to a spacious building in the same locality.

Aravind-Tirunelveli procured Heidelberg Spectralis OCT to better aid in diagnosis and treatment.

Boomi pooja for the new out-patient building at Aravind-Tirunelveli

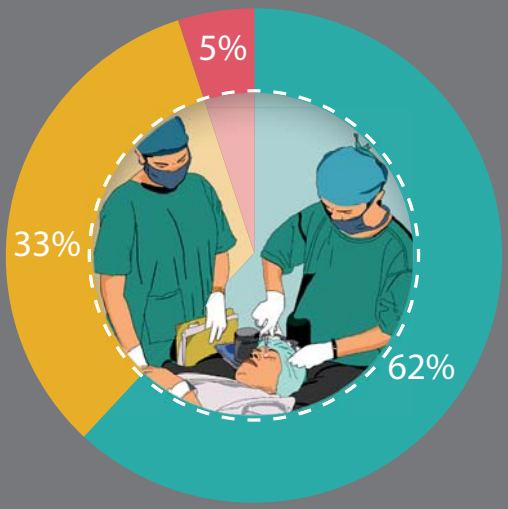
Inauguration of Retina clinic at Aravind-Tirupati

Despite the challenges and lockdowns for over 6 months, the total out-patient visits and surgeries across Aravind saw a reduction of only 38%, compared to the previous year.



OUT-PATIENT VISITS - 2,878,172

- Paying walk in
- Community Eye Clinics and Vision Centres
- Free eye camps and Free walk-in



SURGERIES, LASER PROCEDURES & INJECTIONS - 327,786

- Paying
- Subsidised
- Free

PERFORMANCE APRIL 2020 - MARCH 2021

OUT-PATIENT VISITS

	Total	Madurai
HOSPITALS		
Paying Sections	**1,711,703**	384,923
Free Sections	**484,319**	123,943
OUTREACH		
SCREENING CAMPS*		
Comprehensive camps	**57,258**	25,271
Diabetic Retinopathy screening camps	**3,897**	1,871
Workplace refraction camps	**12,405**	4,894
School children examined by Aravind staff*	**1,076**	-
Paediatric eye screening	**-**	-
Mobile van refraction camps	**2,012**	-
RoP - No. of babies screened in NICUs	**10,914**	1,602
TOTAL FROM SCREENING CAMPS*	**87,562**	33,638
VISION CENTRES	**459,229**	169,646
COMMUNITY EYE CLINICS & CITY CENTRES	**135,359**	75,954
TOTAL OUT-PATIENT VISITS	**2,878,172**	788,104
SURGERIES, LASER PROCEDURES & INJECTIONS		
Paying Sections	**204,233**	54,771
Subsidised (walk-ins to the free hospital)	**108,619**	30,034
Free (through screening camps)	**14,934**	6,377
TOTAL SURGERIES	**327,786**	91,182

**While Aravind team screened 1,076 children, an additional 800 children were*

SURGERIES

	Total	Madurai
Cataract surgeries	**196,751**	52,042
Trab and combined procedures	**4,414**	1,355
Retina and Vitreous surgeries	**12,170**	3,785
Squint correction	**1,080**	374
Keratoplasty (Incl. Graft procedures, Keratotomies, DSAEK)	**1,240**	561
Pterygium surgery	**3,586**	841
Ocular injuries	**1,207**	230
Lacrimal surgeries	**2,324**	1,054
Orbit and Oculoplasty surgeries	**6,897**	2,050
Refractive laser procedures	**4,684**	1,386
Retinal laser procedures	**30,985**	8,041
YAG laser procedures	**33,574**	11,140
Intravitreal injections (Anti VEGF & Steroids)	**22,194**	5,832
Other surgeries, Laser procedures & Injections	**6,680**	2,491
TOTAL SURGERIES	**327,786**	91,182

Theni	Tirunelveli	Coimbatore	Pondicherry	Tirupur	Dindigul	Salem	Tuticorin	Udumalpet	CBE CC	Chennai	Tirupati	Kovilpatti
72,761	222,784	207,629	188,165	47,748	64,176	104,727	52,673	39,182	31,569	179,259	90,283	25,824
18,000	53,835	77,190	70,055	15,017	-	19,841	3,828	14,657	-	50,360	34,935	2,658
3,106	6,282	3,051	10,743	559	-	1,103	1,231	505	-	4,355	1,052	-
-	634	851	408	-	-	133	-	-	-	-	-	-
608	2,339	2,198	1,063	160	-	662	199	124	-	-	158	-
-	-	79	997	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1,506	-	-	-	506	-	-	-	-	-	-
1,393	1,406	5,487	42	-	-	-	-	-	-	963	21	-
5,107	10,661	13,172	13,253	719	-	2,404	1,430	629	-	5,318	1,231	-
42,646	111,324	30,170	79,622	8,352	-	6,952	-	10,189	-	328	-	-
16,939	20,641	-	21,825	-	-	-	-	-	-	-	-	-
155,453	419,245	328,161	372,920	71,836	64,176	133,924	57,931	64,657	31,569	235,265	126,449	28,482
6,527	27,575	30,499	27,358	3,651	4,409	10,433	2,934	3,765	2,520	20,216	7,974	1601
3,089	12,392	19,233	15,402	2,550	867	3,777	787	3,946	-	9,251	6,775	516
424	1,842	1,155	3,054	122	-	366	145	128	-	1,030	291	0
10,040	41,809	50,887	45,814	6,323	5,276	14,576	3,866	7,839	2,520	30,497	15,040	2,117

screened by teachers/vision screeners and found to be normal. This takes the total outreach screening to 88,362.

Theni	Tirunelveli	Coimbatore	Pondicherry	Tirupur	Dindigul	Salem	Tuticorin	Udumalpet	CBE CC	Chennai	Tirupati	Kovilpatti
7,016	24,455	25,954	25,826	5,389	4,095	10,321	3,045	6,800	1,556	18,752	9,869	1,631
10	838	782	688	26	8	238	38	67	14	230	120	-
-	1,271	3,324	1,793	-	-	219	-	-	-	1,294	484	-
-	147	409	64	-	-	-	-	-	-	64	22	-
6	103	341	117	-	-	3	-	-	-	59	50	-
101	270	572	621	110	72	76	10	121	38	440	300	14
3	228	244	234	-	-	22	-	1	-	58	187	-
12	209	382	452	-	11	16	2	-	-	138	48	-
104	569	1,475	1,590	158	90	38	32	39	76	473	171	32
-	694	814	778	-	-	160	-	-	-	729	123	-
984	5,133	6,093	5,563	-	1	935	56	12	374	2,536	1,257	-
1,343	4,176	3,866	3,943	605	969	1,704	659	728	264	2,570	1,173	434
452	2,657	4,789	3,872	1	-	720	4	-	183	2,660	1,024	-
9	1,059	1,842	273	34	30	124	20	71	15	494	212	6
10,040	41,809	50,887	45,814	6,323	5,276	14,576	3,866	7,839	2,520	30,497	15,040	2,117

Projects to enhance eye care service delivery

Impacting quality of life in women through presbyopia correction

Through the project supported by Standard Chartered Bank-Global Business Services (SCB-GBS), Aravind-Coimbatore studies the impact of presbyopia correction on the quality of life in women. The project aims to screen about 25,000 women above 40 years of age. A total of 10 camps were conducted during April 2020 to March 21; over 1,683 women were examined and 465 received spectacles free of cost. Over 35 follow-up camps were conducted to assess the quality of life of these women following spectacle usage.

Improving adherence to follow-up in childhood glaucoma

Supported by United States Agency for International Development (USAID), Aravind Eye Hospital, Madurai has started a project with an aim to improve management of childhood glaucoma by better understanding the context of the caregivers of children with the disease. The objective is to understand the predictors and barriers of adherence to long-term follow up among 140 children diagnosed with childhood glaucoma. During April 2020 to March 2021, 62 children were enrolled in the project and interviews were done with their caregivers. To encourage adherence to follow-up, the project supports travel expenses for the patients and caregivers.

Improving RoP telemedicine systems

Aravind Eye Hospital, Coimbatore with support from USAID, has started a project in November 2020 to improve, expand and innovate the already existing retinopathy of prematurity (RoP) telescreening programme and to develop a care model that is replicable and scalable to other parts of India and around the world. The project provides a complete continuum of care as well as ensures gender equity in access to care. By the end of the project in October 2022, Aravind-Coimbatore is expected to develop into a Centre of Excellence for RoP. The existing telescreening programme will be expanded to Aravind centres in Pondicherry and Tirupati. Innovations like use of low-cost cameras and Artificial Intelligence in identifying cases will be tried. Necessary personnel have been recruited across the Aravind centres to co-ordinate the project activities. Appropriate infrastructure facilities have been put in place at Aravind-Pondicherry and Tirupati; technicians underwent training at Aravind-Coimbatore. Awareness messages on RoP were developed and tested. An exclusive software to capture and maintain details of the project is being developed.

Aravind-Coimbatore received a grant from Seva Foundation to test RoP telescreening on lower cost cameras along with the use of Artificial Intelligence. During the project period, Aravind-Coimbatore will be closely working with Casey Eye Institute-Oregon Health and Science University and the University of Illinois, Chicago in research and publications related to the project.

With support from Cognizant Foundation, Aravind-Chennai started telescreening for RoP. Trained technicians screened 592 babies using Neo forus fundus camera during April 2020 to March 2021. Of these, 381 babies were screened by the retina specialists at government and private NICUs. A total of 15 babies were treated with laser.

Comprehensive centre for correcting facial deformities

Aravind Eye Hospital, Chennai, in collaboration with a faciomaxillary surgeon and a multispeciality hospital, has embarked on a project to develop a comprehensive centre to treat facial deformities. The main objective of the project is to provide surgical care for post traumatic orbital fractures which can be vision threatening. A total of 7 patients underwent surgery during April 2020-March 2021. Patients with congenital facial deformities which can be life threatening in paediatric groups are also provided treatment at an affordable cost.

Field worker visiting the families of children with glaucoma to counsel the caregivers

Eicher Group Foundation-Shroff's Charity Eye Hospital truck drivers eye screening initiative-dedication ceremony of the mobile van

Universal eye health through tech-enabled vision centres

LAICO won a grant from the Federation of Indian Chambers of Commerce and Industry (FICCI) - Millennium Alliance (MA) to provide technical support and training for setting up four tele-medicine enabled vision centres in Bangladesh and Ethiopia over a period of 18 months. Millennium Alliance is a consortium of partners (Public-private partnership) including the Department of Science and Technology, Govt. of India, United States Agency for International Development (USAID), Federation of Indian Chambers of Commerce and Industry (FICCI), UK Government's Department for International Development (DFID), ICCO Cooperation, Netherlands; World Bank Group, Facebook and Marico Innovation Foundation.

Providing optimal care for economically disadvantaged people with ocular trauma

The project anchored by Aravind-Madurai and supported by SCB-GBS aims at supporting 600 patients with ocular trauma and belonging to low socioeconomic status. The project fund supports the cost of investigations, medication, travel and surgery. During April 2020 to March 2021, 43 patients were benefitted.

Truck drivers eye screening initiative

According to a survey conducted by the Eicher Group Foundation (EGF) and Dr Shroff's Charity Eye Hospital (SCEH), one of the major reasons for truck accidents is attributed to poor eyesight of the drivers. To address pertaining eye and ear issues among the truck drivers, Driver Care Programme is being implemented by EGF and SCEH across the country. The programme partners with major eye hospitals in eight states to serve as a nodal point to ensure that the drivers who are reached out and identified with eye ailments get quality treatment. Aravind Eye Hospital, Salem is identified to be one of the partners for this project in the south zone. With the help of a mobile van sponsored by Eicher, eye camps will be conducted in transport hubs, petrol stations, service stations of Eicher, RTO offices, etc. The van is designed with all the necessary eye care diagnostic equipment inside. A team consisting of a technician and counsellors from Aravind-Salem performs eye examination.

Enhancing early glaucoma detection through family screening to reduce glaucoma-related blindness

Since genetic factors play a key role in all major forms of glaucoma, a project to screen the first degree relatives of patients with glaucoma for early detection of the disease was launched. Supported by SCB-GBS, the project is implemented in Aravind Eye Hospitals at Pondicherry, Madurai, Tirunelveli, Coimbatore and Chennai. As part of this project, automated short text messages are sent to the relatives of glaucoma patients motivating them to come for screening. During April 2020 to March 2021, messages were sent to 3,034 first-degree relatives of 1,372 new glaucoma patients. 594 relatives visited

Aravind Eye Hospitals; of these 15 were found to have glaucoma and another 106 were identified as glaucoma suspects and are under observation or advised further evaluation.

Eye care awareness creation

On the occasion of World Sight Day on October 8, an awareness webinar titled *Kannae Nalamaa* was organised for the general public. Senior ophthalmologists gave informative talks on various eye problems. Articles on eye care were published in the print media. Awareness messages in the form of jingles were shared through Radio Mirchi. Aravind-Coimbatore opened its official YouTube channel named, "Aurocovai" to create eye care awareness and offer training. Aravind-Salem organised an exhibition named *Kannae Nalamaa* during October 8-15. Close to 1200 patients/attendants visited.

As part of observing World Prematurity Day, RoP team at Aravind-Madurai visited obstetricians to create awareness about the disease and the screening facilities available at Aravind. The team sought their support to refer premature babies to Aravind for eye examination. An awareness exhibition was arranged in the hospital premises for the benefit of patients and attendants.

World Glaucoma Week was also observed. To alleviate patients' fears and anxieties and to improve cataract surgery acceptance rate, Tulsi Chanrai Foundation Eye Hospital, Abuja, Nigeria started creating awareness amongst patients with the help of videos. During counselling, awareness videos on surgical procedures such as small incision cataract surgery and phacoemulsification are screened to the patients. On the eve of World Glaucoma Week, awareness talks on glaucoma were given on the national television and FM.

Dr. Renu P Rajan handing over RoP awareness poster to an obstetrician at Aravind-Madurai

Awareness exhibition at Aravind-Pondicherry as part of observing World Glaucoma Week

Eye care awareness exhibition at Aravind-Salem

Special 'kolam' at Aravind-Tirupati to commemorate World Glaucoma Week

AADI-A boon to patients with refractory glaucoma

Aurolab aqueous drainage implant (AADI) used in the treatment of refractory glaucoma has been found to have promising results and a number of publications proving its efficacy and safety outcomes in both the adult and paediatric populations have surfaced in numerous peer reviewed journals in the last two years; to name a few, the *AJO; BJO; Journal of Glaucoma; Eye;* and *Ophthalmology Glaucoma*.

Glaucoma surgeons in the developing world have long felt the need for an affordable aqueous drainage implant to tackle refractory glaucoma. Ahmed Glaucoma Valve (AGV), the only available implant costs 350 USD which is more than double the per capita monthly income in the developing countries. Baerveldt Glaucoma Implant (BGI) is the popular, widely used implant in the western world. Its prohibitive cost (700 USD) discouraged companies like Pharmacia and AMO that in turn owned the device to even market it outside the US and Europe.

Prof. Paul Palmberg from Miami and Prof. Alan Robin from Baltimore, both long-time friends of Aravind, were extremely passionate about the third world countries also benefitting from the wonderful design of BGI. They approached Prof. George Baerveldt who immediately agreed to allow Aurolab to use the design of the BGI that he had bequeathed to the glaucoma community. Prof. Baerveldt was delighted at the prospect of his design attaining widespread use to preserve useful vision in thousands of patients in resource poor communities the world over. Aurolab brought to fruition Palmberg's and Robin's dream in mid-2011 by reverse engineering the BGI. Aurolab had to devise methods to reduce manufacturing costs by developing a simple compression moulding process instead of liquid silicone moulding. This affordable aqueous drainage implant (made available at a fraction of the cost of the AGV) was launched in the Tamil month of AADI and was christened AADI (Aurolab Aqueous Drainage Implant) by Prof. Palmberg.

" It is not only about affordability anymore, it is also equally to do with the efficacy of the AADI. Surgeons in the developing world are thrilled to note the unique advantages this larger surface area device offers for filtration and its ensuing benefits especially in the younger age group with intractable glaucoma."

- Dr. George Varghese Puthuran
Chief-Glaucoma Services, Aravind-Madurai

Aravind Eye Care System is extremely indebted to Dr. George Baerveldt for his magnanimity in allowing Aurolab to use his design for developing a glaucoma drainage device. AADI thus evolved and Aurolab was able to offer it at 1/10th of the market price of similar products available then. So far, 14,000 units of AADI have been implanted in patients in 67 countries and many of the recipients were children.
Dr. Baerveldt's kindness and legacy will be remembered forever through these implants and many more that are going to happen in future.

COMMUNITY OUTREACH

I. Free Eye Camps
II. Community Eye Clinics and City Centres
III. Vision Centres

I. Free Eye Camps

Aravind suspended its free eye camps for about 8 months owing to COVID-19 outbreak and the subsequent restrictions for public-gatherings. As the lockdown restrictions were eased, and after getting permission from the authorities, Aravind started conducting work place refraction camps and comprehensive eye screening camps from October 2020 and November 2020 respectively. Despite lockdown and travel restrictions, Aravind teams after getting consent from the authorities, continued to visit neonatal centres to screen babies for RoP and provide tele-consultation.

Reaching out during COVID-19

When the outreach camps were suspended, Outreach Department at Aravind-Madurai in association with LAICO developed alternate methods to reach out to the underprivileged people. A virtual meeting was organised on September 4 and 5 to seek the support of camp sponsors in this initiative and to discuss the action points. New strategies to reach out to patients included conducting small scale camps; sponsors referring patients directly to the base hospital and vision centres; identifying and training volunteers from within the community who can do basic eye screening and refer those who have vision problems to the base hospital.

An initiative named 'Community referral system' was introduced wherein already identified volunteers and sponsors from within the community mobilise people

Dr. S. Mahesh Kumar examining a TNSTC driver at Virudhunagar

with eye problems and help them take up Aravind's services, rather than waiting for free eye camps to happen. These volunteers were given one-day training in basic eye examination. The first training programme was conducted at Vaiyampatti on October 14, 2020. Over 30 people participated.

Similar training programmes were held at Usilampatti and Palani on October 16 and November 6 respectively. 15 volunteers participated in each training programme.

Over 600 drivers of the Tamil Nadu State Transport Corporation (TNSTC) belonging to Virudhunagar Depot, could not get their mandatory annual eye examination done as the hospitals remained closed during lockdown. In response to their request, a team from Aravind-Madurai went to Virudhunagar and screened 616 drivers on May 27 and 28, 2020.

II. Community Eye Clinics and City Centres

During April 2020 to March 2021, four community eye clinics and two city centres together handled 135,359 patient visits.

Mr. R. Meenakshi Sundaram handling a session for the volunteers at the training programme in Vaiyampatti

Outreach Performance

	Total	Madurai	Theni	Tirunelveli	Coimbatore	Pondicherry	Tirupur	Salem	Tuticorin	Udumalpet	Chennai	Tirupati
FREE EYE CAMPS												
Comprehensive Eye Camps												
Camps	**313**	111	27	51	24	40	3	8	10	7	26	6
Patients examined	**57,258**	25,271	3,106	6,282	3,051	10,743	559	1,103	1,231	505	4,355	1,052
Glasses prescribed	**12,794**	5,544	664	1,371	612	2,365	213	303	416	121	937	248
Glasses delivered	**10,021**	3,749	643	1,196	474	2,031	171	263	365	87	828	214
Glasses dispensed on the spot	**8,217**	3,284	500	994	429	1,681	106	174	249	70	661	69
Diabetic Retinopathy Screening Camps												
Camps	**32**	9	-	6	9	6	-	2	-	-	-	-
Patients examined	**3,897**	1,871	-	634	851	408	-	133	-	-	-	-
Diabetics screened	**2,057**	1,034	-	325	414	214	-	70	-	-	-	-
DR Patients screened	**289**	144	-	78	34	24	-	9	-	-	-	-
Refraction Camps												
Camps	**74**	20	3	13	17	9	1	6	2	1	-	2
Patients examined	**12,405**	4,894	608	2,339	2,198	1,063	160	662	199	124	-	158
Glasses prescribed	**3,708**	1,383	110	836	708	369	20	182	47	13	-	40
Glasses delivered	**3,207**	1,343	110	778	442	273	12	168	42	13	-	26
On the spot deliveries	**2,513**	1,179	21	590	343	226	8	94	34	9	-	9
Refraction Camps by Mobile Unit												
Camps	**16**	-	-	-	8	-	-	8	-	-	-	-
Patients examined	**2,012**	-	-	-	1,506	-	-	506	-	-	-	-
Glasses prescribed	**735**	-	-	-	632	-	-	103	-	-	-	-
Glasses delivered	**578**	-	-	-	486	-	-	92	-	-	-	-
Eye Screening of School Children-Base Hospital												
Schools served	**101**	-	-	-	-	101	-	-	-	-	-	-
Camps	**4**	-	-	-	-	4	-	-	-	-	-	-
Teachers trained	**-**	-	-	-	-	-	-	-	-	-	-	-
Total children in school	**1,372**	-	-	-	-	1,372	-	-	-	-	-	-
Children screened by oph.	**997**	-	-	-	-	997	-	-	-	-	-	-
Children received glasses	**403**	-	-	-	-	403	-	-	-	-	-	-
Children identified with eye defects other than Refractive Error	**129**	-	-	-	-	129	-	-	-	-	-	-
Eye Screening of School Children-Vision Centres												
Schools served	**-**	-	-	-	-	-	-	-	-	-	-	-
Camps	**-**	-	-	-	-	-	-	-	-	-	-	-
Teachers trained	**-**	-	-	-	-	-	-	-	-	-	-	-
Total children in school	**-**	-	-	-	-	-	-	-	-	-	-	-
Children screened by oph.	**-**	-	-	-	-	-	-	-	-	-	-	-
Children received glasses	**-**	-	-	-	-	-	-	-	-	-	-	-
Children identified with eye defects other than Refractive Error	**-**	-	-	-	-	-	-	-	-	-	-	-
Paediatric Eye Screening Camps												
Camps	**-**	-	-	-	-	-	-	-	-	-	-	-
Children examined	**-**	-	-	-	-	-	-	-	-	-	-	-
Refractive errors	**-**	-	-	-	-	-	-	-	-	-	-	-
Glasses prescribed	**-**	-	-	-	-	-	-	-	-	-	-	-
Glasses delivered	**-**	-	-	-	-	-	-	-	-	-	-	-
Other defects identified	**-**	-	-	-	-	-	-	-	-	-	-	-
RoP Screening												
Screnning visits	**1,695**	202	89	172	993	8	-	-	-	-	187	44
Babies screened	**10,914**	1,602	1,393	1,406	5,487	42	-	-	-	-	963	21
Babies with RoP	**1,713**	106	25	74	1,437	12	-	-	-	-	40	19
RoP Babies treated	**253**	35	12	84	82	6	-	-	-	-	15	19
VISION CENTRES												
Centres	**91**	33	7	17	8	14	2	5	-	3	2	-
New + Review	**459,229**	169,646	42,646	111,324	30,170	79,622	8,352	6,952	-	10,189	328	-
Out-patients / day	**24**	23	26	28	25	26	20	10	-	18	11	-
COMMUNITY EYE CLINICS AND CITY CENTRES												
Centres	**6**	3	1	1	-	1	-	-	-	-	-	-
New + Review	**135,359**	75,954	16,939	20,641	-	21,825	-	-	-	-	-	-
Outpatients / day	**84**	97	60	78	-	76	-	-	-	-	-	-

III. Vision Centres

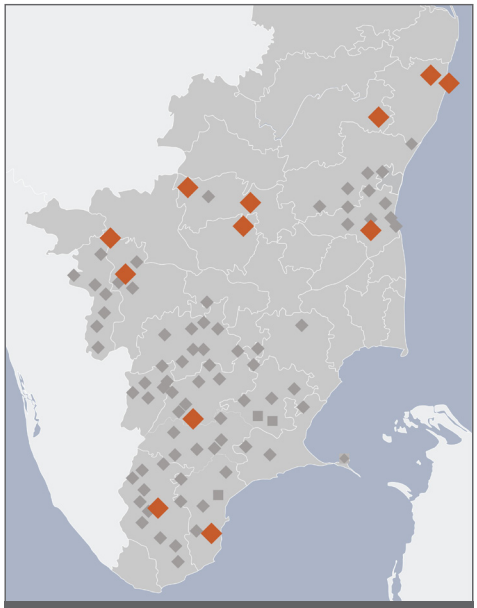
Aravind vision centres remained shut down for about two months since the announcement of lockdown. The re-opening phase of vision centres was truly challenging and had to face many setbacks. COVID-19 safety protocols were meticulously drawn by Aravind's senior clinical team and personal protective equipment were planned for the staff and patients at vision centres.

Strictly following a set of guidelines and standards, a team consisting of a manager, senior nurse, instrument technician, housekeeping and vision entre staff visited each centre and took care of the sterilisation process prior to re-opening. A clear cut layout to ensure social distancing inside the centre was formulated and followed. By the end of May 2020, a few vision centres started functioning. It took three more months for things to fall in place and Aravind vision centres became fully functional in August 2020. Staff were given the necessary protective gears and were educated on the use of them. Care was taken to ensure that patients visiting these centres followed all the precautionary measures. Patient scheduling system was introduced and the centres touched a 70% capacity effortlessly in the first week of re-opening.

Learning never stops

To utilise the downtime caused by lockdown, vision centre staff and technicians were encouraged to update and brush up on their knowledge in ophthalmology. Through Whatsapp, photos and videos on eye conditions were shared based on which daily online quizzes were conducted. The quiz was accompanied with explanations for correct answer and additional reference links. Project ECHO platform was used for learning which provided an opportunity to interact with the experts.

Vision centre team organised a webinar for other eye care organisations to share the safety measures and protocols to be taken into consideration while re-opening the centres post lock-down. A total of 180 participants from various parts of the world participated in this webinar. Aravind team took online sessions on the establishment and running of vision centres for Mission for Vision and Dr.Shroff's Charity Eye Hospital, New Delhi.



Expanding the vision centre network

Despite the crisis created by the pandemic, Aravind was able to open 12 new centres in the last year.

- Existing Vision centres
- Vision centres inaugurated in the last year
  - Eral, September 14
  - Sirumugai, December 14
  - Mecheri, December 25
  - Vandavasi, January 20
  - Alangulam, January 25
  - Namagiripettai, January 29
  - Valapady, February 24
  - Sulur, March 5
  - Chatthirapatti, March 8
  - Sethiyathoppu, March 17
  - Ennore, March19
  - Manali, March 19

Replication of the Aravind model of vision centres

As a testimony to the effectiveness of the Aravind vision centre model, various NGOs have shown interest in setting up similar centres in different parts of the country. Inspired by this model, Rotary International District 3232, as part of its initiative titled "Orange" plans to establish 200 vision centres across India. Nine of these will be managed by Aravind; three have been already opened.

Aravind continued to extend its support to the Govt. of Bangladesh in establishing vision centres in various parts of the country. 50 centres were thus established in 2018 and 2019. In continuation to this, another 40 centres were formally inaugurated by the Hon'ble Prime Minister, Sheikh Hasina in Manikganj, Mymensingh and Comila Divisions in March 2021. Mr. Thulasiraj Ravilla, Director-Operations, Aravind Eye Care System gave a special address at this virtual inauguration ceremony.

ARAVIND INTEGRATED EYE BANK SERVICES

Aravind Eye Banks implemented different strategies to mobilise eye collection during the pandemic. With the lockdown coming into effect, eye bank services at Aravind came to a halt and the eye banks were left with a very minimum number of tissues in hand. These tissue were transferred into glycerine for long-term storage and preservation.

Eye banks were totally shut down in April 2020. By May 2020, the Eye Bank Association of India (EBAI) in collaboration with the All India Ophthalmological Society brought out guidelines on eye banking during COVID-19. Eye bank teams across the Aravind centres reviewed the guidelines, made necessary changes and developed a protocol for eye banking activities at Aravind. Staff was trained on following these protocols strictly. Special care was taken to motivate the field workers and to offer them the necessary psychological support to carry out their tasks without fear.

As per the guidelines, only hospital-based cornea retrieval was allowed until December 2020. Aravind eye banks sought permission from the various hospitals to restart tissue collection in these centres. After informing the state health authorities, eye collection activities resumed, first in hospitals with relatively less potential for eye collection to understand the ground reality. Gradually all hospitals in the network were covered making sure that the teams strictly followed the COVID-19 protocols.

In situ excision of cornea was performed rather than the conventional whole-globe harvesting. Aravind was the first to restart eye banking activities during the pandemic in the entire Tamil Nadu and the first tissue collection was on June 3, 2020. Cornea retrieval from the community was restarted in January 2021 following the guidelines stipulated by the Govt. of India and EBAI.

Rotary Aravind International Eye Bank, Aravind-Madurai formally launched the hospital cornea retrieval programme at Govt. Medical College and Hospital (GMCH), Pudukkottai in the presence of the Dean, medical officers, professors, PGs and paramedics.

Training

Rotary Aravind International Eye Bank (RAIEB) at Madurai offered training to two candidates during April 2020 to March 2021.

Awareness creation

Eye banks across the Aravind centres observed the 35th National Eye Donation Fortnight during August 25-September 8, 2020. Most of the programmes were organised virtually as the situation demanded.

Statistics

Centre	Eyes collected	Eyes utilised in Aravind	Sent to other institutions
Madurai	835	590	46
Coimbatore	298	207	4
Tirunelveli	157	65	1
Pondicherry	74	20	6
Total	1364	882	57

Dr. N. Venkatesh Prajna and Mr. Saravanan at the launch of hospital cornea retrieval programme at GMCH, Pudukkottai

Education and Training

COVID 19 lockdown, the 'never ever before' situation has given rise to many first-of- its- kind events. For the first time ever, Aravind had to call off its structured training programmes and fellowship courses. After an initial phase of bewilderment, Aravind, going by the new norm of digital learning, started offering virtual CMEs and webinars targeting different cadres of eye care professionals and focusing on clinical as well as eye care management topics.

Webinar: Managing eye care services during COVID-19 pandemic

After consulting several published guidelines and interacting with experts, Aravind developed a set of protocols to be followed in order to deliver quality services, at the same time safeguarding the health of staff and preventing the spread of Covid-19. With support from LAICO, a series of webinars titled *Managing eye care services during COVID-19 pandemic*, were organised to share these protocols, guidelines and resources with the wider ophthalmic community. The following topics were covered:

- Patient care protocol during COVID-19 (April 14)
- Patho-physiology of COVID-19 and treatment options (April 15)
- Risk of COVID-19 spread through the ocular route (April 15)
- Protocols and guidelines for use of personal protection equipment (PPE) (April 24)
- Operation theatre protocol (May 8)
- Preparing vision centres for post lockdown days (May 15)

Similarly, Aravind Eye Hospital, Coimbatore organised the following webinars:

- Role of management & managers in ensuring safety during COVID-19 (August 6)
- Hospital infection control practices revisited in COVID-19 times (August 12)

Continuing education programmes organised by Aravind

- CME on Ophthalmic imaging, Aravind-Tirunelveli (April 20-23)
- Review learning on advancement and development (ReLOAD) in phacoemulsification, Aravind-Coimbatore (May 13)
- AI in ophthalmology, Aravind-Pondicherry (July 2-23)
- Update on neuro-ophthalmology (UNO) 2020, Aravind-Coimbatore (July 20-25)
- Refraction simplified, Aravind-Coimbatore (July 31)
- Orthoptics decoded, Aravind-Tirunelveli (August 28-29)
- Library webinar, Aravind-Coimbatore (October 6)

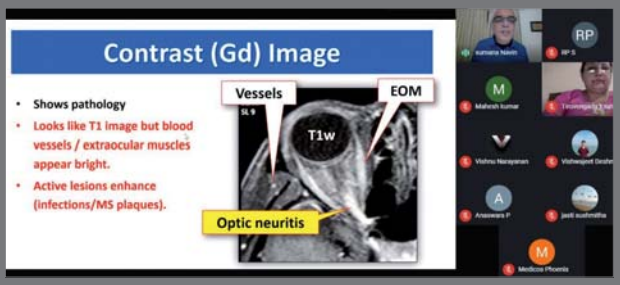
ReLOAD session at Aravind-Coimbatore

COVID-19 paved the way for teaching and learning becoming online. Adapting to the new-normal, Aravind offered many online training programmes and CMEs.

Apart from this, there were a few in-person training sessions arranged by different centres for their doctors and allied ophthalmic personnel.

Phaco development workshop, Aravind-Madurai

Library webinar, Aravind-Coimbatore



Update on neuro-ophthalmology, Aravind-Coimbatore

Role of management and managers in ensuring safety during COVID - 19, Aravind-Coimbatore

Retina alumni webinar, Aravind-Madurai

AI in ophthalmology, Aravind-Pondicherry

Orthoptics decoded, Aravind-Tirunelveli

Participants of Writathon

Dry and wet Lab, Aravind-Pondicherry

- An update on hypertensive retinopathy, Aravind-Madurai (October 7)
- Aravind retina alumni webinar series, Aravind-Madurai (October 7; November 11; December 9 and January 23)
- Phaco development workshop, Aravind-Madurai (November 6-7)
- Webinar on refraction, Aravind-Coimbatore (December 10)
- Webinar on hospital infection control and OT protocols, Aravind-Coimbatore (December 17)
- SICS webinar, Aravind-Chennai (February 16)

Writathon

Aravind-Pondicherry

To utilise free hours due to COVID lockdown to its maximum productivity, an academic extravaganza in the form of Writathon was organised to achieve maximum publications. In this sprint-like event, doctors sat together with a team of biostatistician, project coordinators and librarian and worked hard to submit their manuscript according to the guidelines of the journal. As a promising outcome, half a dozen articles by doctors at Aravind-Pondicherry got published in Indian Journal of Ophthalmology, August 2020 edition.

At the inauguration of SICS Simulator

Infrastructure development for better learning

Aravind-Pondicherry, July - 23

Aravind-Pondicherry opened a dry and wet lab for providing better learning experience to allied ophthalmic personnel and doctors respectively.

HelpMeSee sponsored two simulators to Aravind Eye Hospital, Madurai to help trainee surgeons gain surgical skills and knowledge required to perform manual small incision cataract surgery. The simulator was inaugurated by Dr. G. Natchiar on March 26, 2021.

As part of a project supported by Standard Chartered Bank-Global Business Services, the free section at Aravind Eye Hospital, Madurai has been equipped with a state-of-the-art surgical training centre to monitor and improve trainee surgeons. A total of 311 doctors underwent training during April 2020 to March 2021.

Allied ophthalmic personnel training

Supported by a grant from SEVA, Canada, Aravind-Chennai opened iLearn Training Hub, a learning centre for allied ophthalmic personnel (AOP) and optometrists. Inaugurated on February 26, the training hub has both classrooms and skill labs for all departments of ophthalmic nursing and allied services. The skill lab displays the mission and key performance indicators of the department, instruments and equipment, and posters relevant to learning the skills. Equipment include keratometer, autorefractometer,

Dr.G. Natchiar inaugurating iLearn Training Hub

lensometer, trial set, digital vision chart, Bjerrum's screen, slit lamps, BP machine, pulse oximeter, crash cart and ECG machine.

Steps are underway at Aravind Eye Hospitals - Madurai, Chennai, Coimbatore and Tirunelveli - to offer a graduate course in optometry. Procedural formalities are currently being carried out for affiliation. Aravind is also trying to get affiliation for Diploma course in Optometry and Ophthalmic Technology for all its centres.

A.M. Alagupandi, Refraction Services, Aravind-Madurai emerged all India topper at the visual acuity recertification test conducted as part of Retina Focus Study.

AOPs across the Aravind centres were encouraged to submit papers for various conferences. About ten posters and papers submitted by the AOPs from various centres for annual conference of VISION 2020 were published on the Vision 2020 website.

A total of 60 AOPs from opticals and refraction departments attended a 4-part webinar series conducted by Vision 2020 in collaboration with Essilor from February 2-27, 2021. They received certificates for participating in this.

Centre for excellence in allied ophthalmic personnel training

With funding support from Standard Chartered Bank, a project is being implemented by LAICO to develop Aravind into a centre for excellence in training allied ophthalmic personnel. The project aims to develop standardised, high-quality training and assessment materials for over 300 competencies that eye care professionals need. These resources will be available through the web-based application (www.aurosiksha.org); which will also help Aravind and other eye care organisations to manage their AOP training. During the lockdown months of April and May 2020, Aurolab used this website to conduct online assessments for 192 of its employees. Even when Aravind's primary eye care centres had to be closed down, vision technicians were keenly engaged with daily quizzes that were shared through Whatsapp.

Skill assessments for AOP trainees and re-assessments for AOP employees were initiated at Aravind Eye Hospital, Madurai from July 2020.The process started with skill mapping, reviewing assessment tools, preparing master-assessors and setting up the skill assessment stations. Over 330 AOP staff at Aravind have been enrolled and are undergoing skill competency assessment. Each AOP requires to be competent in a set of skills pertaining to his or her job role.

A.M. Alagupandi - All India topper at the visual acuity recertification test

AOPs at Aravind-Madurai undergoing exam as part of their training

The days of uncertainty brought in by the lockdown and being in the hostel away from the family was emotionally stressful to many of the AOPs. To address this several activities were organised to lift up their spirits as well as to offer a good learning experience. Awareness exhibitions on varied clinical topics were also arranged by various centres.

Handicrafts by AOPs in different centres during lockdown







Exhibition during lockdown, Aravind-Udumalpet

Awareness creation on multiple sclerosis, Aravind -Coimbatore

Learning session at Aravind-Pondicherry

Yoga during lockdown, Aravind-Madurai

Residents social responsibility during COVID

Mr. S. Venkatesan, MP - Madurai receiving residents' contribution to the Annavaasal initiative

Residents social responsibility programme at Aravind-Madurai remained active even in the era of COVID-19. Execution was modified due to the circumstances, but the spirit continued. RSR programme supported Annavaasal, an initiative launched by Mr.S.Venkatesan, Member of Parliament (MP), Madurai to distribute free food packets to the workers in unorganised sectors and their families during lockdown. In collaboration with the NGO partner, Enlight, with whom Aravind has been working for the past 5 years, bed sheets were provided to destitute people living by the road side. For the third consecutive year, dresses were distributed to the HIV infected orphans in Anbagam Home, Dindigul on the occasion of Diwali. At Aravind-Tirunelveli, residents and senior medical officers distributed kits containing essential grocery items for the families of the hospital's sanitary staff, security personnel and lift operators.

Distribution of grocery kit, Aravind-Tirunelveli

To Sir(s), with Love

Dear Chairman Sir

Aravind trained us. It is our duty and our honor to do something now...

More than 20 trainees donated 36,000 Yuan within hours. Two of them just visited Madurai for one week.

One donor is from Wuhan which you know was the epicenter just months ago. He had been working at the frontline for months. He was a trainee in Tirunelveli. . .

Dear Sirs, please take care, stay safe.

Yours,
Hao

That sweet note is from Dr. Hao, who did his IOL training and glaucoma fellowship at Aravind-Tirunelveli. A good friend of the Aravind family and a great ambassador for Aravind's work, Dr Hao took the initiative to get in touch with other Chinese ophthalmologists who had trained at Aravind. Together they have arranged to send 200 safety goggles and 2,000 N-95 equivalent masks.

Dr. Hao with Sanil and Dr. Sivakumar

Dr. Ramakrishnan with Dr. Hao and Dr.Zhang Lei

Thank you Dear Aravind alumni in China!
We are touched by your kind gesture in this time of need!

Candidates Trained 2020 - 2021

Total Candidates: 243

POSTGRADUATE COURSES	
Diploma in Ophthalmology (2 years)	8
Master of Surgery in Ophthalmology (3 years)	13
Diplomate of the National Board (3 years)	21
Post DO DNB (2 years)	20
LONG-TERM OPHTHALMOLOGY FELLOWSHIP	
Ant. Segment / Intraocular Lens Microsurgery (2 years)	18
Orbit & Oculoplasty (18 months)	7
Paediatric Ophthalmology & Strabismus (18 months)	12
Glaucoma (2 years)	14
Retina Vitreous (2 years)	27
Cornea (18 months)	26
Comprehensive Ophthalmology (2 years)	4
Fellowship in General Ophthalmology	16
SHORT-TERM FELLOWSHIP (FOR INTERNATIONAL CANDIDATES)	
Orbit & Oculoplasty (6 months)	1
Cornea (1 year)	1
Retina (1 year)	2
SHORT-TERM CLINICAL COURSES FOR OPHTHALMOLOGISTS	
Neuro-Ophthalmology (3 months)	1
Phacoemulsification (1 month)	2
SHORT-TERM PARAMEDICAL COURSES	
Orthoptist (6 months)	2
MANAGEMENT COURSES	
Project Management training for Eye Care online) (4 weeks)	16
Online Course on Ophthalmic Instruments Maintenance - Part I (2 weeks)	32

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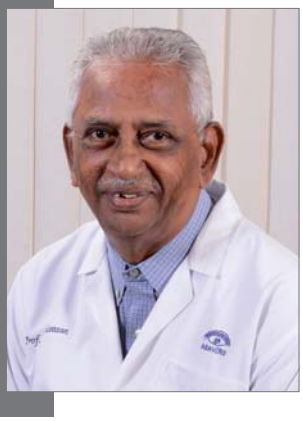
One among the top 2% . .

Aravind is proud to note that one of its founders, Dr. M. Srinivasan found mention in the list of world's top 2% scientists in ophthalmology, as per a Stanford University study. Throughout Dr. Srinivasan's career, he has conducted several research studies, both clinical and epidemiological including drug trials. He has also conducted several WHO sponsored population based studies. The evidence from these studies has shaped the way cornea diseases are being addressed across the developing world.



Consultancy and Capacity Building

Thanks to technology, LAICO continued its offer of specific capacity building inputs to other hospitals by way of virtual classes and webinars, despite lockdown. A typical day during lock down started with the entire faculty meeting over a video-conferencing system which is continuing even now. During this, each member gives updates on their projects; commitments are made on new activities.

Thrice a week, the team engaged themselves on a joint learning session of the course, Model for Improvement offered by Institute of Health care Improvement, Boston. Later, the course was extended to doctors and managers at Aravind with the principal objectives of improving and sustaining better health outcomes in populations; introducing fundamental concepts of the importance of quality improvement, bettering patient care flow processes; ensuring patient safety and facilitating improvement of leadership capabilities.

LAICO organised a series of webinars which dealt with pertinent topics in ophthalmology and eye care delivery, especially in the context of COVID-19 pandemic. Faculty engaged in cleaning up systems relevant to the current times and spreading the revised versions across Aravind centres in consultation with the management and senior ophthalmologists. Realising that many smaller eye hospitals across India were handicapped in knowing how to manage their day-to-day operations during the pandemic, LAICO also organised a series of weekly webinars to share the guidelines.

Consultancy and Capacity Building

LEAP collaborative series

LAICO launched three more series in the LEAP collaborative:
Collaborative on Establishing and strengthening vision centres (October 2020 to September 2021): The collaborative aims to facilitate eye hospitals to establish new vision centres and increase the efficiency of the existing centres. Two learning sessions were organised, in October 2020 and March 2021 respectively. Nine hospital teams - 5 from India, 2 from Nepal, 1 each from Bangladesh and Guatemala - are participating. Prior to the first learning session, a webinar titled, *Viable primary eye care delivery through vision centres* was conducted in September to reinforce the importance of achieving universal eye health coverage through vision centres and to generate interest among the eye hospitals to enrol for the collaborative.

Community referral system (December 2020 - July 2021): The collaborative aims to enable LAICO's partner hospitals in Lavelle, GSI and HCI projects to create access to eye care by strengthening community referral mechanism. 16 hospital teams are participating in this collaborative and the first learning session was held in December 2020.

Implementing NABH standards for entry level certification (February 2021 - January 2022): The collaborative intends to guide eye hospitals aspiring to get NABH entry level certification. The first learning session was rolled out in February 2021. Five hospital teams are participating. In order to develop internal capacity to handle sessions in this series, Aravind team attended Certified Professionals for Quality Implementation in Hospitals (CPQIH) Course organised by Consortium of Accredited Healthcare Organisations (CAHO) from December 1-3, 2020.

Free cataract surgery programme in collaboration with Bosch

LAICO in collaboration with Bosch India Foundation facilitated free cataract surgery programme for the identified persons living in the villages adopted by BOSCH as part of its CSR programme. The programme aimed to provide 870 free cataract surgeries through Aravind Eye Hospitals and LAICO's partner eye hospitals in India during September 2020 to March 2021. A total of 249 villages located in the vicinity

of Bosch's manufacturing plants in the districts of Tirunelveli, Coimbatore, Chennai, Nasik, Bangalore, Ahmedabad, Pune and Jaipur were identified. As part of this programme, Aravind Eye Hospitals at Tirunelveli, Chennai and Coimbatore collectively performed 300 cataract surgeries. LAICO's partner hospitals performed 570 surgeries.

Global Sight Initiative collaboration

Supported by Seva Foundation, LAICO has embarked on a project to build the capacity of 11 of its already existing partner eye hospitals in the Global Sight Initiative (GSI) network, of which three are Aravind centres. The one-year project was started in March 2021 and focuses on mentoring, supporting free cataract surgeries and providing equipment support.

Cataract quality improvement intensive project

Cataract being the leading cause of avoidable blindness, Fred Hollows Foundation (FHF) has initiated a project to develop systems and protocols to ensure high quality in cataract care delivery. The project is implemented in three of FHF's partner hospitals in Bangladesh, Ethiopia and Kenya. LAICO's helps develop learning materials on productivity, cost efficiency and environmental sustainability and share these with the select three hospitals via webinars. The first webinar will be held in May 2021.

Support to partner hospitals to combat COVID-19

LAICO with funding support from Seva Foundation, helped its partner hospitals in the GSI network, offset the impact that they have had in the context of COVID-19 pandemic. The project was started in June 2020 and the fund is used to equip the hospitals with necessary personal protective equipment and consumables as well as provide operational support to offset losses due to COVID-19 crisis. Fourteen hospitals have benefitted from this project.

ACCESS Phase III

LAICO, Hilton Foundation, and Dana Center for Preventive Ophthalmology work with four partner hospitals of the ACCESS network on a project mode for 18 months. The four hospitals are Fitsum Birhan Specialised Eye Clinic, Mekelle, Ethiopia; Kisii Eye Hospital, Kisii, Kenya; City Eye Hospital, Nairobi, Kenya and Eye Foundation Community Eye Hospital, Lagos, Nigeria. The two-year project started in July 2020 aims to help these hospitals continue to maintain the project target of annual cataract surgical volume and clinical outcome at 85%. It also aims to support the hospitals to strengthen their operations by deploying EMR and developing telemedicine facilities, increasing outpatient volumes, and setting up primary eye care centres. Necessary funding support was given to these hospitals to help them manage the crisis caused by COVID-19.

Enhancing LAICO's capacity to bring an effective change in eye hospitals

LAICO's organisational level intervention is designed to engage partner hospitals to bring about strategic changes for improved service delivery. Given the rapidly evolving ecosystem, LAICO has to supplement this by addressing operational aspects to drive better service delivery. This requires a detailed mode of collaboration and intense engagement with the participating eye hospitals, involving hospital leadership as well as operational level staff, working together to identify and implement solutions. As a new strategic direction to take this forward, LAICO with funding support from Hilton Foundation has started a project in November 2020. The project focuses on LAICO's capacity building to develop a robust system and apply it by developing new service offerings that are highly relevant to enhance the effectiveness of eye hospitals in improving service delivery.

Strengthening community referral system

As the regular free eye camps were stopped due to COVID-19 crisis, Aravind introduced community referral system wherein camp sponsors and village volunteers identify people who need eye care and refer them to Aravind Eye Hospital, Madurai. To strengthen this initiative, LAICO, with the help of Lavelle capacity building fund, offered to support 1,000 free cataract surgeries for patients belonging to lower socio economic groups. 817 cataract surgeries were thus done free of cost.

Teaching and Training

Launch of Eyexcel 2.0

Since 2007, LAICO has been offering the Eyexcel Global course, in association with Seva Foundation and International Council of Ophthalmology. Eyexcel prepares eye hospitals to deliver high-quality training. To make sure that these teams are supported in their efforts and to keep them updated with best practices

and new technology in the field of education, an online resource was created: Eyexcel 2.0. Launched on July 29, 2020, Eyexcel 2.0 offered a refresher course on the concepts of training design and delivery. It is a growing library of resources for eye care training institutions. An important and useful feature that is offered to alumni and subscribers, is the monthly webinar which brings in experts in the field of training to share best practices and new technology. As part of Eyexcel 2.0, three webinars were conducted for trainers of allied ophthalmic personnel: on leveraging technology for learning, on training assessment and on effective presentation skills. Altogether, 270 participants took part

Aurosiksha

The pandemic has forced several allied ophthalmic personnel (AOP) to resort to digital platform for learning. More than 20 new skill checklists and over 50 other training resources for AOP were published on the Aurosiksha website (www.aurosiksha.org).

During the lockdown months, as eye care services were severely affected but this downtime needed to be used constructively and this was an opportunity to reinforce learning. While there were a flurry of webinars and quizzes available for doctors, there was little training opportunity for AOP cadres. Aurosiksha launched the Lockdown Quiz Series targeted at AOPs worldwide, posted on Aravind's Facebook page. Through this effort 27 daily quizzes were published and AOP from 128 eye care institutions responded to these quizzes. Aurosiksha continues to offer the monthly online quizzes. Quizzes covered diverse topics like, neuro-ophthalmology, fundus imaging, visual acuity, magnitude of blindness, diabetes and the eye, and ocular pharmacology.

Aurosiksha's online learning management system was also used to conduct online assessment for over 100 vision technicians across 9 hospitals in March 2021.

The Spanish version of Aurosiksha's Library or AOP training resources (www.aurosiksha.org/es/lica/library) was launched in February 2021. The Spanish translation was created in collaboration with Visualiza Eye Hospital in Guatemala and Divino Nino Jesus in Peru.

Online course on ophthalmic instruments maintenance

Being one of more popular courses, the instrument maintenance course had to go online due to the pandemic. This two-week online certificate course featured five common ophthalmic instruments and provided instruction on the working of the instrument, its care and maintenance and how to troubleshoot common issues. Since February 2021, 32 participants from Ghana, Ethiopia, USA, Sudan and India have completed this course.

Online course on project management

With travel restrictions, another one of LAICO's annual course went online. The first batch of the Online Course on Project Management for Eye Care was launched in December 2020. Sixteen participants from eight countries attended this three-week course. The course included self-paced video sessions, exercises to help participants apply the learning and live sessions where they presented their work to their peers and faculty. The course saw active participation from the trainees.

October Summit 2020

As part of October Summit 2020, an online training-of-trainer workshop was conducted for trainers of allied ophthalmic personnel (AOP). Organised on October 29 and 30, the workshop had over 350 registrations from 32 countries; it discussed good teaching practices and explored solutions for common challenges faced by AOP trainers.

Projects

- Providing optimal care for economically disadvantaged people with ocular trauma, Aravind-Madurai: funded by Standard Chartered Global Business Services (GBS) Pvt Ltd

Participant feedback-Quiz

"I was satisfied with the quiz. I wasn't very familiar with the anatomy of the cornea. Thank you for this step. I would request for more quizzes during this period."
- Milka Mwikali, Lions Sight First Eye Hospital-Loresho

"This surely seems to be a useful activity. As editor of the optometric journal Optometry Today, I'm including information on Cataract based on the February Quiz in its March 2020 issue. Due credit is of course being given to the source."
- *Dr. Narendra Kumar, BAMS, DROpt, PGCR, Ophthacare Eye Centre*

- RoP Telescreening project, Aravind-Madurai: funded by Standard Chartered Global Business Services (GBS) Pvt Ltd
- Setting up of surgical training centre at Free section, Aravind-Madurai: funded by Standard Chartered Global Business Services (GBS) Pvt Ltd
- Improving adherence to follow-up in childhood glaucoma, Aravind Madurai: funded by USAID
- Impacting quality of life in women through Presbyopia correction, Aravind Coimbatore: funded by Standard Chartered Global Business Services (GBS) Pvt Ltd
- Improving RoP telemedicine systems in southern India, Aravind-Coimbatore: funded by USAID
- Evaluation of artificial intelligence in a large ROP tele-screening programme in southern India with additional evaluation of lower-cost camera systems, Aravind Coimbatore: funded by Seva Foundation
- Enhancing early glaucoma detection through family screening to reduce glaucoma related blindness at Aravind tertiary care centres-Pondicherry, Coimbatore, Madurai, Tirunelveli and Chennai
- RoP screening and treatment programme in underserved and rural areas of Tiruvallur, Kancheepuram, Vellore and Chennai Districts, Aravind-Chennai: funded by Cognizant Foundation
- Aravind centre for technology assisted facial alignment and surgical treatment (ACT-FAST) - Project SHINE, Aravind-Chennai: funded by TATA Lockheed Martin Aero Structures Ltd (TLMAL)
- Setting up 6 Phaco training centres across the country for making phaco surgery popular, Aurolab: funded by Standard Chartered Global Business Services (GBS) Pvt Ltd
- Vision centre project (Cycle 7): funded by TOMS through Seva Foundation
- Vision centre projecs (Cycle 9) for 3 VCs: funded by TOMS Seva Foundation
- Vision centre projects (Cycle 10) for 4 VCs: funded by TOMS Seva Foundation
- Setting up of 10 vision centres as part of Dr. V's birth centenary commitment: funded by Seva Foundation
- Universal eye health through tech enabled vision centres: funded by FICCI-Millennium Alliance
- Centre for Excellence in allied ophthalmic training: funded by Standard Chartered Bank
- Enhancing eye care services in Indian sub-continent, LAICO: funded by Lavelle Fund for the Blind
- Leap-together towards excellence collaborative series to enhance eye care, LAICO: funded by Lavelle Fund for the Blind
- ACCESS - African centres of excellence in cataract surgical services (Extension of HCI phase II), LAICO - funded by Conrad N. Hilton Foundation
- Enhancing LAICO's capacity to bring an effective change in eye hospitals, LAICO-funded by Conrad N. Hilton Foundation

Health Services Research

As an initiative to enable more staff members to involve in research projects leading to publications, the first half of every Saturday has been scheduled for research-related work. Staff who have taken up research projects assemble in a classroom to sit and work exclusively on their respective projects. The Research Division provides support in terms of consultation on study design, data collection, management and analysis and manuscript preparation.

LAICO's weekly journal club discussed 43 research publications with active participation from staff from all Aravind centres and external partner institutions. Seven articles based on health service research studies were published in national and international peer reviewed journals. Following are the on-going health service research projects at LAICO:

- Impact of electronic medical record implementation on provider and patient satisfaction
- Pattern of uptake of training programmes over two decades at an international ophthalmic training institute in India
- Estimation of global cataract surgical rate
- Comprehensive eye care work assessment study in Theni district of Tamil Nadu
- Investigating accuracy of a simple, portable refractive error estimation device compared with standard subjective refraction-a diagnostic accuracy study
- Impact of a structured mentoring model in enhancing eye care services in the Indian Sub-Continent
- Compliance on usage of low vision aids and spectacles and assessment of visual function and quality of life in a southern Indian population.
- Diagnostic and economic yield of neuroimaging in neuro-ophthalmology
- Evaluating the impact of a field vision assistant on the uptake of vision centre services
- An assessment of factors influencing compliance to cataract surgery advice
- Evidence based management of out-patient cycle time in a setting with fluctuating demand

Research

AMRF hopes to explore new avenues for research especially in the areas of stem cells for age-related macular degeneration, regeneration of retinal pigment epithelium and Acanthamoeba keratitis. Despite the challenges caused by the pandemic, the scientists continued to engage in their research activities and shared project updates through virtual meetings. While lab schedules and meetings take up most of the time on regular working days, the lockdown gave space for many of them to concentrate on long-pending manuscript works for submission to journals. A total of 18 publications were thus brought out.

Molecular Genetics

Genetics in ocular disorders is becoming increasingly important for an accurate molecular diagnosis and for the development of novel genotype specific treatments. Molecular Genetics lab currently focuses on the leading cause of inherited retinal dystrophies to understand the molecular mechanism underlying disease pathogenesis in cone-rod dystrophies, retinitis pigmentosa (RP), Stargardt, Leber's congenital amaurosis (LCA), Juvenile X-linked retinoschisis (JXLR) and Leber's hereditary optic neuropathy (LHON). LHON is a mitochondrial disorder leading to central vision loss due to selective degeneration of retinal ganglion cells. Mitochondrial Genome Sequencing helped to detect disease causing mutations in 51% of the LHON suspected individuals. In addition, the team uses Next Generation Sequencing (NGS) to understand the role of mito-nuclear cross talk in LHON by focusing the intricate involvement of 1,158 mito-nuclear genes in primary mitochondrial DNA mutation negative patients. Furthermore, a recent five-year prospective study (2015-2019) in the Neuro-ophthalmology Clinic at Aravind Eye Hospital, Madurai estimated the prevalence of LHON at a rate of 1:1689 or 5.92 per 10,000 patients. Leber's Congenital Amaurosis (LCA) is the predominant form of childhood blindness (20%), accounts for 5% of all retinal dystrophies due to degeneration of photoreceptors in the retina. With the involvement of 29 genes, the state of LCA is highly heterogeneous, which is further complicated by sharing common clinical features with other retinal dystrophies. Therefore, the lab focuses on targeted exome sequencing to detect the causative mutations in the southern Indian LCA patients by using MiSeq for early diagnosis. Based on the results, genotype-phenotype correlation is being performed to determine the association between the identified genes and ophthalmological findings of LCA patients. JXLR is an X-linked recessive genetic disorder leads to schisis in the retinal neural layers. The team uses Sanger sequencing to identify the RS1 gene mutations in the affected individuals. In addition, Whole Exome Sequencing identified a novel homozygous mutation c.G310A in the BEST1 gene, likely to be associated with JXLR. Moreover, the lab offers genetic counselling based on moral and ethical values to provide the best possible solution for people at risk.

Preparation of PCR products for Agarose Gel Electrophoresis

Research findings of ocular cancer analysis were translated to patient care. Genetic testing of retinoblastoma patients helped in the genetic counselling of 38 families during the year. Larger deletion of chromosome 13 beyond the region of RB1 gene was identified for the first time in a unique patient with retinoblastoma, Waardenburg syndrome and Hirschsprung disease. Alteration of genes involved in cell proliferation was identified in the tumour samples of retinoblastoma that serve as potential drug targets. Epigenetic and gene expression studies suggested the role of cancer specific pathways in the process of tumorigenesis of RB.

Proteomics

Research at the Proteomics department focuses on ocular diseases such as fungal keratitis, keratoconus and diabetic retinopathy. A complete array of proteomics approaches are employed to understand the pathological mechanisms underlying these diseases. This is possible through the state-of-the-art proteomics facility equipped with two mass spectrometers and a complete infrastructure to carry out both gel-based and non-gel based proteome analysis. The outcomes of the basic research provide leads for the translational research that strives to improve disease management at a personalized level.

In India, fungal infections contribute to more than 50% of infectious keratitis, with Fusarium and Aspergillus flavus being the two important etiological agents. In-depth and comprehensive tear proteome analysis lead to the understanding of the pathological mechanisms underlying A. flavus keratitis. The team's recent in vitro studies have proven that the outer most layer of the cornea, the epithelial layer, is capable of engulfing the fungal spores. This is an important finding since the epithelial layer not only protects the cornea from infections but is also involved in clearing the invading pathogen well before the immune cells are recruited to the site of infection.

Although the host immune response plays a significant role in the severity of the ulcer and thereby, the treatment outcome, the current treatment protocol for fungal keratitis primarily targets killing the fungi. Based on the team's previous tear proteome studies, six proteins representing different pathways were shortlisted as indicators of the host inflammatory response. Levels of these proteins were quantified in tears collected from keratitis patients and compared with the levels in tear from healthy individuals. Comparative analysis revealed that all the six proteins were significantly altered during Fusarium and *A. flavus* infection. Three of these proteins (complement factor B, alpha-2 macroglobulin, calprotectin) served as indicators of severity of the infection while two other proteins (complement factor H, vimentin) were suggestive of the extent of healing in keratitis patients. Together, these five proteins were able to predict whether a fungal keratitis patient would respond or not respond to treatment with 86% sensitivity and 86% specificity. The phase 2 of this study is currently in progress where the level of these five tear biomarkers will be assessed in keratitis patients in Fusarium, *A. flavus* and other fungal infections as well.

Research scholar in Proteomics performing ELISA immunoassay for serum biomarkers

In diabetic retinopathy (DR), the primary focus had been the identification and validation of prognostic biomarkers - proteins that can predict the onset of DR in type 2 diabetic individuals (T2DM) or that can determine the progression of DR in a NPDR patient. A multitude of proteome approaches were employed to compare the serum proteome profile across the different control (non-diabetic and T2DM) and DR patient groups (NPDR and PDR). Based on this study and reports from other other groups, 12 candidate markers were selected for validation in a study cohort of Indian and UK population. Validation of these 12 markers would eventually result in the selection of DR specific biomarkers for which sensors will be developed that are easy to use and sensitive to quantify the markers in the field. In addition to the serum markers, the team is also examining circulating microparticles in blood as a source of biomarkers. Validation of microparticle proteins has led to the identification of a platelet specific integrin protein to be specifically altered during the progression of DR. Additional microparticle proteins are currently being validated as biomarkers.

A novel chemical cross-linker for the treatment of keratoconus has been formulated through an Indo-UK collaborative project involving the Cornea department at Aravind Eye Hsopital, AMRF, Aurolab and the University of Liverpool. The chemical cross-linker has shown promising results both in ex vivo pig eyes and human eyes and in vivo rabbit eyes in terms of increasing the stiffness of the cornea with negligible cytotoxicity to the cells of corneal layers. This chemical cross-linker is currently being evaluated as an alternative to conventional UV-A cross-linking treatment. From the above study, a new project has

Discussion underway at the Bioinformatics lab

been granted by ICMR to investigate the mechanism of action of the cross-linker in human corneas. Analysis of the modulation of transcripts in the corneal layers by the application of the cross-linker, the effect of cross-linker on the enzyme activity of matrix modulating enzymes and collagen fibril assembly in the cornea are being carried out to achieve the objectives of the new project.

Bioinformatics

Bioinformatics lab primarily uses the next-generation sequencing methods to understand the role of the genome, transcriptome and epigenome on eye disease diagnosis, prognosis and pathogenesis. The lab developed a machine learning model that identifies the pathogenic variants from thousands of variants from genome/exome data of eye diseases. Further, a machine learning model was trained to distinguish and prioritize the pathogenic variants of eye diseases from other diseases. In tandem, the lab is interested in human small-noncoding RNAs called miRNAs that could be used as diagnostic and prognostic markers for intra-ocular tuberculosis (IOTB) and fungal keratitis. The lab is the first to report that four such miRNAs are identified in IOTB patients and their possible role in tuberculosis pathogenesis via tuberculosis-related pathways. This study identifies that miRNAs as potentially ideal biomarkers in the aqueous humor of IOTB patients.

Ocular Pharmacology

Glucocorticoids (GCs) are widely used in ophthalmology for their anti-inflammatory and immune-modulatory properties. Long-term use induces ocular hypertension (GC-OHT) and glaucoma in susceptible individuals. However, the molecular pathogenesis is not yet fully understood.

As a step towards this goal, a perfusion cultured human anterior segment (HOCAS) ex vivo model system was established to induce GC-OHT experimentally in human cadaveric eyes to determine GC responsiveness and the cultured trabecular meshwork cell strains (cells from tissue of interest) with known GC responsiveness was established in order to identify the dys-regulated miRNAs and genes using RNA Seq technology. A number of dys-regulated miRNA-mRNA pairs were identified in cultured trabecular meshwork cells derived from experimentally induced glucocorticoid-ocular hypertension (GC-OHT) and validated. The miRNA manipulation experiment is underway with mimics and inhibitors to provide the "proof of concept" and its relevance in GC responsiveness. A set of dys-regulated miRNAs may be used as a surrogate marker to determine GC responsiveness prior to treatment and also miRNA based therapeutics are of some potential use in the management of GC-OHT /glaucoma.

Ocular Microbiology

The research focus of the department is on ocular pathogen epidemiology, host-pathogen interaction and antibiotic resistance mechanisms. Ocular infectious diseases are poorly understood which are highly challenging for diagnosis or treatment. Currently high throughput advanced Next Generation Sequencing (NGS) methods are being employed for the identification of diagnostic markers as well as understanding the pathogens at genome level. Currently, profiling of microRNA in ocular fluids of

Ocular pharmacology lab

the ocular tuberculosis patients are in progress for identifying unique microRNAs, which can be explored as diagnostic markers. DNA bar coding and genotyping are routinely employed for the characterisation of unidentifiable bacterial and fungal species causing ocular infections.

In addition, pathogenic Acanthamoeba species isolated from corneal infections, are cultivated in actively dividing state in a bacteria-free, liquid-culture condition (axenic) to study its interaction with the host cells (human corneal epithelial cells). In this study, Acanthamoeba infection induced cellular changes, including cell death and cytokine gene expressions are assessed using biochemical and molecular biology tools. This study will provide better insight about the differential virulence of pathogens and its ability to induce host response in correlation with severity of keratitis.

Immunology and Stem Cell Biology

Adult Stem cells are primitive cells that divide to repopulate themselves and also to differentiate into the tissue specific cells, thus maintaining the normal function of the tissue throughout life. Understanding the basic biology of these tissue resident stem cells in human eye – their identification, location in specialised micro environment, role in tissue function, changes with ageing and diseased condition are the major thrust of research work in this department. Studies are being carried out on the following stem cells of human eye in relation to specific ocular disease or disorder to develop better cell based therapies for these ocular conditions.

Limbal epithelial stem cells and limbal stem cell deficiency: Extensive studies on limbal epithelial stem cells established a specific method for their identification, a two-step protocol for their enrichment and identified two miRNAs (small non-coding RNAs) to regulate the maintenance of stem cells. Studies have been initiated to evaluate whether these regulators can convert a differentiated corneal epithelial cells to adult stem cells.

Trabecular meshwork stem cells and glaucoma: Previous studies from this laboratory established that there is a reduction in the trabecular meshwork stem cell content in donor eyes with glaucoma, characterised by a drastic reduction in the trabecular meshwork cells. Studies carried out using a cell loss glaucomatous human organ cultured anterior segment (HOCAS) model indicated that transplantation of cultured trabecular meshwork stem cells aids in restoring the normal intraocular pressure, thus indicating the possibility of establishing a cell based therapy for glaucoma.

Lens epithelial stem cells and cataract: Stem cells for the human lens epithelium were confirmed to be located in the central region of the anterior lens epithelium. In addition, culturing of whole lens with neural retina induced new fibre formation in the equatorial region highlighting their role in the normal maintenance of tissue. Further studies are being carried out to elucidate the role of the lens epithelial stem cells in cataract.

Retinal pigment epithelial stem cells and age related macular degeneration: Preliminary studies on human retinal pigment epithelium has identified that the stem cells with high proliferative potential are located in the peripheral region. Studies are being carried out to evaluate the changes in the stem cell content with ageing and in age related macular degeneration.

Ph.D awarded by Madurai Kamaraj University for the studies carried out at AMRF

Ms. S.Yogapriya
Department of Immunology and Stem Cell Biology
Thesis: *Understanding the role of trabecular meshwork stem cells in the maintenance of tissue homeostasis in normal and glaucomatous human eyes*
Guide : Dr. C. Gowri Priya

Mr. K. Thirumalairaj
Department of Molecular Genetics
Thesis: *Characterization of genetic and transcriptional alterations in retinoblastoma*
Guide : Dr. A. Vanniarajan

Ongoing Projects

Basic research

- *Pathogenesis of human mycotic keratitis*
- *A prospective multi-centre discovery and validation of diagnostic circulating and urinary biomarkers and development of sensor(s) to detect sight threatening diabetic retinopathy*
- *Proteome profiling of serum microparticles in diabetes and diabetic retinopathy patients: Towards identification and validation of predictive biomarkers*
- *Prediction of treatment outcome in fungal keratitis patients*
- *Development of aptamer-based assays for diagnosis of infectious keratitis and absolute quantitation of proteoform markers of diabetic retinopathy*
- *Screening of an extended family with early onset glaucoma for Myocilin gene mutations*
- *Interaction of pathogenic fungi with human corneal epithelial cells*
- *Understanding the mechanism of action of a novel chemical cross-linker designed to treat keratoconus*
- *Identification of druggable targets for attenuating the progression of pterygium development*
- *Role of retinol binding protein 3 (RBP3) in progression of diabetic retinopathy (DR) and evaluate its potential as a DR biomarker in type 2 diabetes patients*
- *Molecular genetics of ABCA4 gene in autosomal recessive cone rod dystrophy and retinitis pigmentosa*
- *Understanding the molecular mechanisms of chemoresistance in retinoblastoma*
- *Molecular characterization of tumor progression in retinoblastoma*
- *Identification and validation of deregulated cancer pathways in retinoblastoma*
- *Translational genomics of ocular cancers*
- *COE LEAD: Translational genomics of paediatric eye diseases*
- *COE PR-I: Molecular analysis of mitochondrial diseases with ophthalmic manifestations*
- *COE PR-II: Epigenetic mechanisms underlying tumor progression in retinoblastoma*
- *COE PR-III: Functional validation of novel candidate genes using alternate model*
- *COE R&D: Computational methods for whole exome/genome sequencing of paediatric eye diseases*
- *Molecular genetics of juvenile X-linked retinoschisis*
- *Molecular characterization of ocular lymphoma for improved disease prognosis*
- *Targeted modulation of E2F3 and KIF14 pathway in retinoblastoma refractory to existing chemotherapeutic drugs*
- *Characterization and functional evaluation of trabecular meshwork stem cells in glaucoma pathogenesis*
- *Characterization of adult human lens epithelial stem cells in the maintenance of tissue homeostasis throughout life and their functional status in cataractous lens*
- *Understanding the role of trabecular meshwork stem cells in the maintenance of tissue homeostasis in normal and glaucomatous human eyes'*
- *MicroRNAs specific to corneal epithelial stem cells*
- *Characterization of adult human lens epithelial stem cells, their niche and their role in the maintenance of tissue homeostasis*
- *Identification and characterisation of adult human retinal pigment epithelial stem cells*
- *Role of miRNA in the regulation of glucocorticoid receptor (GR) signalling and development of new therapeutics for steroid-induced glaucoma*
- *Diagnostic markers for ocular tuberculosis*
- *Comparative genomics of Methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa ocular isolates from keratitis patients with different clinical outcomes*
- *Role of human corneal MiRNAs in the onset and severity of fungal keratitis*
- *Clinical significance of the type three secretory system, biofilm formation and antibiotic resistance of the Pseudomonas aeruginosa isolated from keratitis patients*
- *Identification of bacterial and fungal pathogens by rDNA gene barcoding in vitreous fluids of endophthalmitis patients*
- *Clinical and demographic study of non-tuberculous mycobacterial ocular infections in south India*
- *Contribution of macrophage migration inhibitory factor (MIF) in the immunopathology of human microbial keratitis and its utility in disease management*
- *Comparative proteomics of extracellular proteins of A.Flavus and Fusarium solaris*

Clinical research

Glaucoma

- *Family primary glaucoma evaluation study*
- *Intraocular pressure dynamics after water drinking test and diurnal variation test in glaucoma suspects*
- *Intraocular pressure changes after silicone oil removal in eyes with and without secondary glaucoma*
- *Ocular biometry and choroidal thickness changes after mannitol in vitrectomized and non vitrectomized eyes*
- *To study the long-term efficacy & safety of micro-pulse transscleral cyclophotocoagulation (MP-TSCPC) in eyes with uncontrolled glaucoma*
- *Impact of COVID-19 pandemic on medication adherence of patients diagnosed with glaucoma - A telephonic survey.*
- *Comparison of efficacy using ripatec eye drops with PG Analogue and fixed combination drops in lowering intraocular pressure in primary open angle glaucoma*
- *Long term surgical outcomes of glaucoma secondary to ICE syndrome- a retrospective study*
- *Analysis of incidence, clinical presentation, risk factors for secondary pupillary block glaucoma in patients undergoing vitreoretinal surgery*

- *Clinical characteristics and long term treatment outcomes in patients with juvenile glaucoma*
- *Long term surgical outcomes of primary congenital glaucoma in a south Indian population*
- *Clinical and demographic profile of patients presenting with ocular emergencies in the glaucoma outpatient department during the Covid-19 lockdown in a tertiary eye hospital in South India*
- *Retrospective analysis of the comparison between CO2 laser-assisted deep sclerectomy combined with phacoemulsification and conventional trabeculectomy with phacoemulsification*
- *Role of diode CPC in the management of refractory glaucomas : A retrospective study*
- *Surgical outcomes of superotemporal versus inferonasal placement of Aurolab aqueous drainage implant in refractory pediatric glaucoma*
- *Retrospective analysis of surgical outcomes of combined procedure of phacoemulsification with Aurolab aqueous drainage implant in eyes with refractory glaucoma and coexistent cataract*
- *Outcomes of phacoemulsification in adult glaucomatous eyes with pre-existing non-valved Aurolab aqueous drainage implant*
- *Retrospective analysis of outcomes of various surgical modalities in patients with uveitic glaucoma*
- *Shared medical appointments-a randomised trial*
- *The Asia primary tube versus trab study*
- *Enhancing early glaucoma detection through family screening to reduce glaucoma related blindness*
- *A comparison of subtenons versus topical anesthesia in trabeculectomy and phacotrabeculectomy surgeries*
- *A prospective randomised comparative study of efficacy and safety of subtenon injectable 20 Microgram MMC Vs 40 Microgram MMC in trabeculectomy patients*
- *A prospective randomised study of the safety & efficacy of an ab Interno sulcus technique vs anterior chamber implantation of Aurolab aqueous drainage tube in refractory glaucoma*
- *Enhancing early glaucoma detection through family screening to reduce glaucoma related blindness*

Cornea

- *Steroids and cross-linking for ulcer treatment*
- *Automated quantitative ulcer analysis study*
- *Parasitic ulcer pilot study*
- *Rose bengal electromagnetic activation with green light for infection reduction study*
- *Seasonal conjunctivitis outbreak reporting for prevention and improved outcomes*
- *Metagenomic analysis and diagnosis of ulcers rapidly with artificial intelligence: SCUT II screening*
- *Identification of druggable targets for attenuating the progression of pterygium development*
- *A prospective observation study of the socio economic, demographic profile, health seeking behaviour, cost implications, clinical features and visual outcomes following a penetrating ocular trauma*
- *Outcomes of early steroids and corneal collagen crosslinking (CXL) adjuvant therapy in bacterial keratitis – a randomised control trial*
- *Changes in endothelial specular microscopy findings – a comparison before and after hypotonic corneal collagen cross-linking*
- *To compare femtosecond laser assisted LASIK (femto-LASIK) and photorefractive keratectomy (PRK) in terms of astigmatism correction in patients with <= 3.0 D of myopic cylindrical error*

Cataract and IOL

- *Visual performance comparison between phacoemulsification and manual small incision cataract surgery in eyes with senile cataract: a prospective randomised clinical trial*
- *The natural history of intraocular lens in eyes with exfoliation syndrome*
- *Effect of Nd:YAG laser posterior capsulotomy on higher order aberrations*
- *Active sentry versus ozil hand piece – a prospective comparative study*
- *Aravind pseudoexfoliation syndrome*
- *Preoperative cataract surgery visual acuity: trends in a developing country eye care system*
- *Reasons for delay in cataract surgery in patients with advanced cataracts during the COVID-19 pandemic*

Retina and Vitreous

- *A two-arm, randomised, double-masked, multicentre, phase III study assessing the efficacy and safety of Brolucizumab versus Aflibercept in adult patients with visual impairment due to diabetic macular edema*
- *Translating research into clinical and community practice: a multi-state, multi-centre statistical modelling of risk-based stratified and personalised screening for complications of diabetes in India.*
- *A phase III, comparative, double blind, randomised, multi-centric study to compare the efficacy, safety and immunogenicity of sun's Ranibizumab with reference biologic in patients with neovascular age-related macular degeneration (wet AMD)*
- *Evaluate the long term efficacy and safety of Ranibizumab compared with laser therapy for the treatment of infants born prematurely with retinopathy of prematurity*
- *Statistical modelling and risk assessment of type 2 diabetes complications in India*
- *Structured post-marketing surveillance to collect the safety data of intravitreal aflibercept injection in patients of wet age-related macular degeneration during real world clinical practice.*
- *Scope – RoP tele screening study*
- *Long-term effects of semaglutide on diabetic retinopathy in subjects with type 2 diabetes (FOCUS Study)*
- *A multi-centre, randomised, double-masked, active-controlled, comparative clinical study to evaluate the efficacy and safety of MYL-1701P and eylea® in subjects with diabetic macular edema*

- *A randomised, phase 3, double-masked, parallel group, multi-centre study to compare efficacy and safety of QL1205 versus lucentis in subjects with neovascular ARMD*
- *A multi-centre, extension study to evaluate the safety and efficacy of MYL-1701P in subjects with diabetic macular edema completed MYL-1701P-3001 study*
- *A randomised, active-controlled, double-masked, parallel-group, phase 3 study to compare efficacy and safety of CT-P42 in comparison with eylea in patients with diabetic macular edema*
- *A prospective study with aim of developing machine learning algorithms for patients with glaucoma, retinal pathologies, and normals*
- *Is chatbot the answer to patient queries during Covid 19 crisis?*
- *Chatbot as an aid to patients with diabetic retinopathy requiring medical intervention. Is it the answer to all their queries?*
- *Utility of chatbot in counseling and education of patients undergoing retinal detachment surgery.*
- *Utility of chatbot in counseling and educating parents of children with retinopathy of prematurity*
- *Utility of chatbot in counseling and educating parents of children with retinoblastoma.*
- *Evaluation of performance anxiety in surgeons performing internal limiting membrane peeling*
- *Evaluation of inner retinal alterations after internal limiting membrane peeling*
- *Short term study on efficacy of Nepafenac 0.1% in center involving diabetic macular edema with good vision in phakic eyes – a pilot study*
- *Retinal changes in acute central retinal artery occlusion- a spectral domain optical coherence tomography imaging study*
- *Clinical presentation and prognostic factors affecting surgical outcomes of secondary macular holes after retinal vein occlusions*
- *Long term follow up of presumed ocular tuberculosis patients*
- *Vitrectomy for complications of proliferative diabetic retinopathy in young adults: clinical features and surgical outcomes*
- *To evaluate the outcome and safety profile of short-term perfluorocarbon liquids tamponade in comparison to buckle-vitrectomy in case of rhegmatogenous retinal detachment associated with choroidal detachment*
- *Scleral fixated intraocular lens implantation for refractive rehabilitation in eye with spherophakia*
- *Surgical outcomes in idiopathic epiretinal membranes – Indian insight into ectopic inner foveal layer classification scheme*
- *Treatment of retinopathy of prematurity outside international classification of RoP (ICROP) guidelines*
- *Evaluation of treatment outcomes in APRoP and treatable RoP*
- *To evaluate the effect of COVID-19 pandemic and national lockdown on patient care at a tertiary-care ophthalmology institute*
- *Detachment of internal limiting membrane (ILM) – a novel optical coherence tomography biomarker in central retinal vein occlusion (CRVO) with macular edema*
- *Bilateral central retinal artery occlusion: a retrospective analysis of etiology, presentation and management*
- *Clinical profile and management of cases with ocular perforation secondary to pre-operative local anesthetic injection*
- *Chronic central serous chorioretinopathy with posterior cystoid retinal degeneration: a retrospective analysis of clinical presentation, management and therapeutic role of eplerenone*
- *Cardiorespiratory events associated with vitreoretinal surgeries: causes and outcomes*
- *Influence of systemic disease on visual function of Tamil Nadu state transport corporation drivers*
- *Subjective high-risk patient counselling randomisation project*
- *A study on the differential expression of piwi-interacting RNAs (piRNA) and altered Piwi-like protein interactions in diabetic retinopathy*
- *Comparison of staging of diabetic retinopathy by an offline artificial intelligence with onsite doctor examination and fundus grading by retina specialist*
- *Outcomes of nucleus drop in a tertiary care institution - a retrospective study*
- *Validation of an automated screening of diabetic retinopathy using medios artificial intelligence on a standard fundus camera – a retrospective study*
- *A retrospective study of central serous chorioretinopathy in diabetic retinopathy*
- *A retrospective study of baseline characteristics of patients with cute central serous chorioretinopathy predictive of need for angiography and laser*
- *Improving RoP telemedicine systems in South India*

Uvea

- *A phase III, multi-centre, sham-controlled, randomised, double-masked study assessing the efficacy and safety of intravitreal injections of 440 µg DE-109 for the treatment of active, non-infectious uveitis of the posterior segment of the eye.*
- *Visual prognostic indicators of sarcoid uveitis in a case series of Indian population*
- *Macular edema Nepafenac vs. Difluprednate uveitis trial*

Orbit

- *Identification and validation of deregulated cancer pathways in retinoblastoma*
- *Translational genomics of paediatric eye diseases*
- *Translational genomics of ocular cancers*

Paediatric Ophthalmology and Adult Strabismus

- *Effectiveness of sub- tenon's block in decreasing oculocardiac reflex in paediatric strabismus surgery.*
- *Long term outcomes of paediatric cataract surgery - 10 year follow up study*
- *Comparison of measurement of abnormal head posture by smartphone application vs cervical range of motion (CROM) in ophthalmic disorders*

- *Pre and post training impact analysis among person with visual impairment*
- *Visual impairment in children with multiple disabilities among schools for children with special needs*
- *Yoke prism in children with cortical visual impairment*
- *Impact of online vision therapy in the pandemic*

Health services research

- *Impact of electronic medical record implementation on provider and patient satisfaction*
- *Pattern of uptake of training programmes over two decades at an international ophthalmic training institute in India*
- *Estimation of global cataract surgical rate (CSR)*
- *Comprehensive eye care work assessment (CEWA) study in Theni district of Tamil Nadu*
- *Investigating accuracy of a simple, portable refractive error estimation device (ClickCheckTM) compared with standard subjective refraction – a diagnostic accuracy study*
- *Impact of a structured mentoring model in enhancing eye care services in the Indian Sub-Continent*
- *Compliance on usage of low vision aids and spectacles and assessment of visual function and quality of life in a southern Indian population.*
- *Diagnostic and economic yield of neuroimaging in neuro-ophthalmology*
- *Evaluating the impact of a field vision assistant on the uptake of vision centre services*
- *An assessment of factors influencing compliance to cataract surgery advice*
- *Evidence based management of out-patient cycle time in a setting with fluctuating demand*

Clinical trials: Aurolab

- *To study the safety and performance of high refractive index (HRI) cast molded hydrophobic Intra Ocular Lenses (IOLs) with age-related cataract patients.*
- *Study of safety and performance of a new coating on preloaded intraocular lens delivery system meant for 2.2mm incision*
- *Effect of preloaded Capsular Tension Ring (CTR) on clinical outcomes during and after phacoemulsification cataract surgery*
- *To study the safety and efficacy of polyglactin-910 sutures in ophthalmic surgical procedures.*
- *A prospective, open label, observational study to evaluate the safety and surgical performance of Aurolab's round stock surgical blades for making corneal incisions during cataract surgery-*
- *To evaluate the efficacy and safety of Aurolab aqueous drainage implant (AADI) on intraocular pressure reduction in paediatric patients with refractory glaucoma*

Ophthalmic Supplies and Equipment

Even as the pandemic continued to impact the world, Aurolab geared up to equip itself towards ensuring continuous supply of its products in the market. With strict adherence to safety protocols at the workplace and implementing work from home initiatives, Aurolab managed to ensure hassle-free manufacturing operations in place.

In response to the need of the hour

When the pandemic hit the nation, Aurolab took charge of procuring Personal Protection Equipment (PPE) for all Aravind Eye Hospitals as well as framing protocols for the use of these. After consulting several published guidelines and interacting with other institutions in India and elsewhere, Aurolab documented the PPEs required for the various clinical departments. These included masks, respirators, gloves, face shields and gowns.

As face shields and slit lamp shields were not available in the market, Aurolab, utilising available resources, designed a simple, yet effective product to serve the purpose. With everyone asked to wear masks and respirators, supply could not meet the demand. It became imperative that masks and respirators be reused after proper decontamination process. The validated process for reuse of respirators is exposure to UV light within a fixed distance and at a particular wavelength. Since there was no such equipment in the market, Aurolab ingeniously modified the unused case sheet racks from Aravind Eye Hospital to build a cabinet that is safe, follows all the validated protocols and effectively decontaminates the respirator.

Aurolab put together a safety kit comprising two face shields, two bottles of antiseptic solution and a slit lamp shield; in line with the organisational ethos of sharing and caring, over 2,800 such kits were delivered free of cost to ophthalmologists across Tamil Nadu during the lockdown. Aurolab also supplied 870 indirect ophthalmoscope shields and devices (I-Opener) to aid paramedics to instil eye drops.

Health care service providers are at high risk in times of pandemic and can become potential

Slit lamp shield

Face shield

Indirect ophthalmoscope shield

Safety kit

UV cabinet for decontaminating masks

bearers of the infection. If adequate precautions are not taken, outpatient departments and operating rooms can potentially expose patients as well as care providers to infection. Amongst healthcare providers, ophthalmologists are at a greater risk as most of the examination procedures require close proximity with the patient. To create awareness on how to mitigate the risk of infection, Aurolab conducted the following webinars on the appropriate use of personal protective equipment and protocols to be followed in ophthalmic surgeries:

- COVID-19 protocols to be followed during cataract and anterior segment surgeries, July 9 -10
- COVID-19 protocols for ophthalmic surgeries under general anesthesia, July 9 - 10

Awareness posters were printed in regional languages and fixed across 1800 hospitals in the country to educate patients on the safety measures to be followed in the context of COVID-19.

Marketing

To equip field staff with better technical knowledge of Aurolab's products and to make them aware of the importance of customer centric approach, national level sales training programme was conducted in Bengaluru from December 14-18.

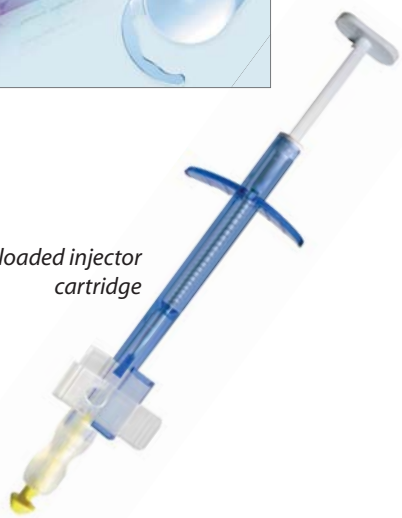
Virtual training programmes and webinars on Aurolab products were conducted for the sales teams as well as domestic and international dealers. Online tests were conducted for the participants using LAICO's Aurosiksha platform. Dealership network was expanded to cater to the growing needs of the global ophthalmic community. The International Marketing department continued to ship the received orders, despite tough times. As a philanthropic move, safety kits consisting of face shield, slit lamp protective shield, I-Opener were supplied free of cost to eye hospitals in Nepal and Iran. Aurolab provided hands-on training on the use of IOLs to counsellors, optometrists and fellow surgeons at Chaitanya Eye Hospital, Trivandrum on March 12.

Inauguration of the national level sales training programme

New products

Aurolab soft-launched Aurovue Vivid, a hybrid MF refractive - diffractive Extended Depth of Focus (EDoF) intraocular lens (IOL). This hydrophobic, foldable preloaded IOL with 360 degree posterior square edge has been uniquely designed to provide excellent visual acuity for far and intermediate vision, and reasonably good near vision.

Aurolab's disposable pre-loaded injector cartridges have been enhanced with a slippery coating for smooth delivery of IOLs into the patient's eye. This new coating causes very low surface friction and is highly suitable for 2.2mm incision cataract surgeries.



Pre-loaded injector cartridge

One-stop solution to set up vision centres

Recognising the impact of vision centres in ensuring primary eye care delivery, Aurolab, in collaboration with LAICO offers a one-stop solution for eye hospitals interested in establishing vision centres or improving the already existing ones. The package offers necessary equipment to set up a centre, service support, training of personnel in tele-consultation and vision centre management software. The initiative was well-received by eye hospitals and NGOs working in eye care. More than 50 vision centres (VC) were thus set up across the nation during April 2020 to March 2021.

Regulatory activities

Aurolab got FDA GMP approval from Philippines after successfully completing the audit held online in November 2020. Despite the challenges caused by the pandemic, Aurolab successfully completed the registration of around 30 products, medical devices and equipment across various countries.

Aurolab got license for manufacturing Riboflavin ophthalmic solution used in the treatment of progressive keratoconus, and Cornisol, a corneal preservative in September and December 2020 respectively. Aurolab is the only company in Asia to receive license for manufacturing Cornisol.

Aurolab installed building management system in the manufacturing division to effectively monitor and manage environmental conditions, thereby ensuring cleanliness and an ideal atmosphere for the manufacturing of drugs.

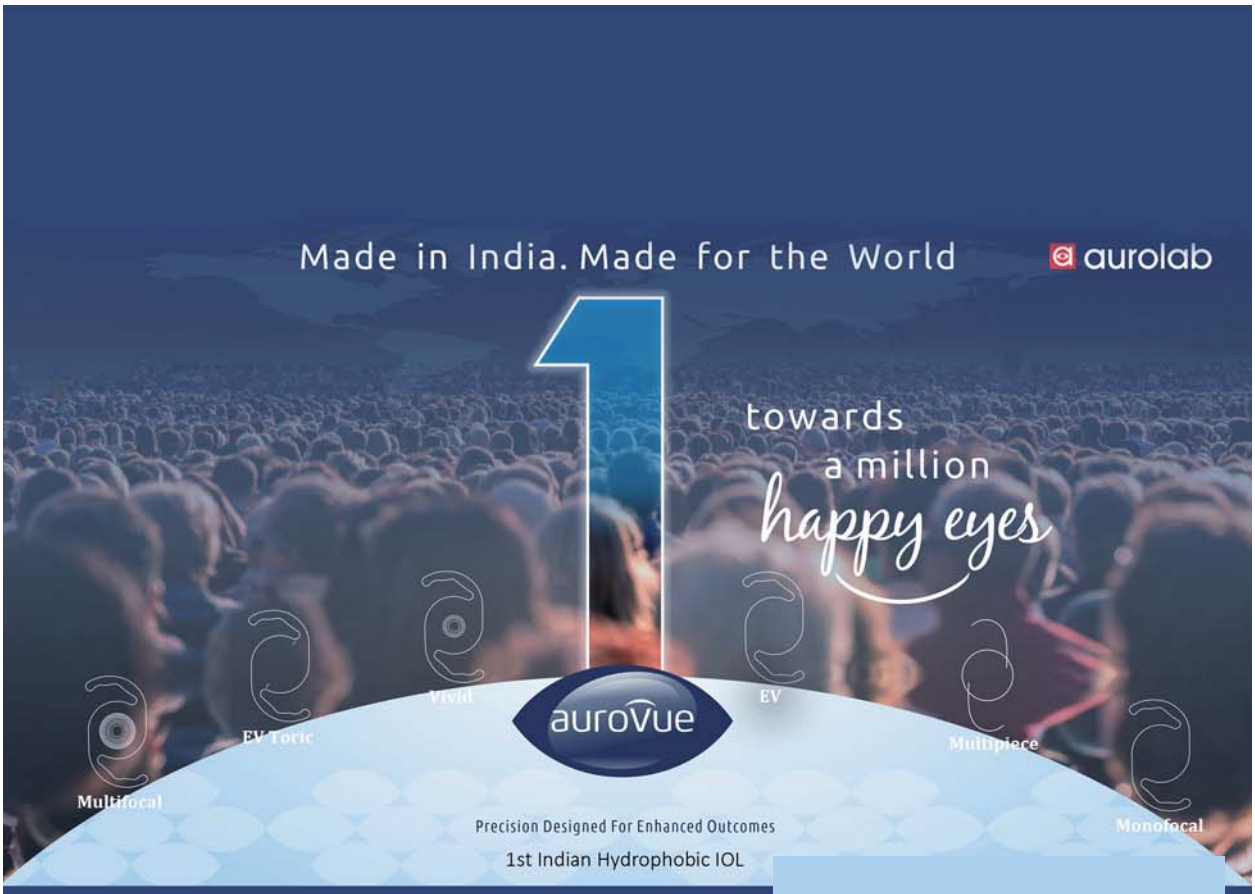
During eye examination using a slit lamp, ophthalmologists are at high risk of being infected by the SARS-Cov-2 Virus. To address this issue, Aurolab came up with a patient-side slit lamp shield. This can be attached to the slit lamp's chin rest and will serve as a protective shield between the patient and the ophthalmologist. The shield is made up of durable plastic and designed to be compatible with various brands of slit lamps available in the market. Aurolab was granted with the Certificate of Design Registration for this product.

Human resource development

Training on first aid measures and basic lifesaving techniques was organised regularly. Participants felt these sessions useful and informative.

To develop interest in Gandhian thoughts and principles, Aurolab in association with Gandhi Museum, Madurai facilitates a one-year Certificate Course in Gandhian Thoughts for production staff. A total of 115 have enrolled for the course.

At the inauguration of a vision centre established by RIO- PGIMS, Rohtak, Haryana using Aurolab's package



Aurovue, India's first indigenously developed IOL crossed one million implants world-wide in January 2021. To mark the occasion, Aurolab conducted a nation-wide campaign titled, "Towards a Million Happy Eyes" to thank its customers.

As Aurovue touches 1 million, the total number of people seeing through Aurolab lenses has grown to 30 million.

It was a journey started way back in 2005.

Mechanical properties of hydrophobic IOLs are temperature dependent. The material formulation underwent several changes to make the IOLs suitable for the conditions in developing countries. The machining technology too, went through many changes. Though it took time for Aurolab to adapt to the technology, today, it has gained mastery in material formulation and machining.

Mr. R.D. Sriram
Managing Director
Aurolab

Recognitions and Achievements

RECOGNITIONS

The Greenberg Prize: End Blindness 2020

December 14

Aravind Eye Care System (AECS) was among the select few for The Greenberg Prize: End Blindness 2020. The award was announced in 2012 to recognise the work of the scientific and medical communities who have pioneered breath-taking advances in the fight to end blindness, between then and 2020. Prize recipients were honoured in two categories: Outstanding Achievement Prize and Visionary Prize. Aravind's Chairman, Dr. R.D. Ravindran was honoured in the Outstanding Achievement category in recognition of his profound contribution towards treating and curing blindness. The award was given at a virtual ceremony on December 14, 2020.

CAHO Award for Best Innovation

September 25-29

Aravind Eye Hospital, Pondicherry won the Best Innovation Award for *I-Opener*, a device to aid paramedic to instil eye drops, at the 5th International Healthcare Technology Conference organised by Consortium of Accredited Healthcare Organisations (CAHO).

FICCI Annual Healthcare Excellence Awards

October 24

Aravind-Pondicherry won special mention under the category, Excellence in Telemedicine / Digital Health at the annual FICCI Healthcare Excellence Award ceremony.

Adherence to the quality certification standards - Certificate of Appreciation

January 26

Aravind Eye Hospital, Madurai was presented with a Certificate of appreciation by the Govt. of Tamil Nadu in recognition of its adherence to the quality certification standards of Chief Minister's Comprehensive Health Insurance Scheme – Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana. On behalf of the hospital, Dr. S.R. Krishnadas, Director-HR received the award from the honorable District Collector, Madurai.

FICCI Healthcare Quality Award

March 20

Aravind Eye Hospital was awarded the FICCI Healthcare Quality Award - Beacon of Excellence with affordable healthcare at the 13th TANCARE conference held at Madurai. Dr. R.D. Ravindran received the award.

Dr. T. K. Alexander Memorial Oration

November 27

Kerala Society of Ophthalmic Surgeons honoured Dr. P. Namperumalsamy, Chairman Emeritus - AECS with Dr. T.K. Alexander Memorial Oration Award. He delivered the oration titled, *Institution Building: Academic and professional Excellence*.

Lifetime Achievement Award

December 29

Dr. P. Namperumalsamy was honoured with the Lifetime Achievement Award by the Association of National Board Accredited Institutions. The award recognised his inspirational work in promoting NBE courses at Aravind as well as his phenomenal work in the field of ophthalmology.

One among the top 2% ...

A study published by the Stanford University in October 2020 mentioned Dr. M. Srinivasan, Director Emeritus - AECS, in the list of World's top 2% scientists, in the Ophthalmology category.

IAPB Vision Excellence Award

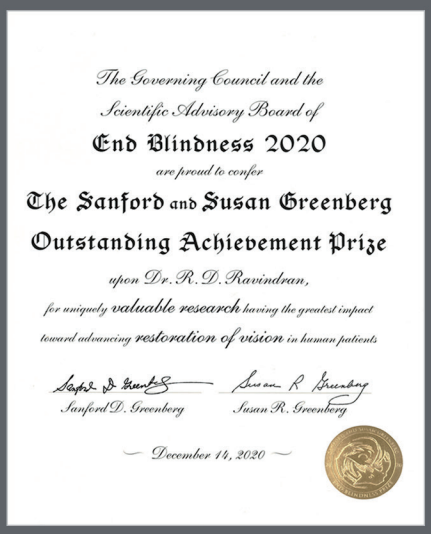
July 8

IAPB honoured Mr. Thulasiraj Ravilla, Director – Operations, AECS with the Vision Excellence Award to recognise his vision, drive, commitment and quality of work that contributed to realising the goals of VISION 2020.

Dr. R.N. Gandhewar Oration Award

December 27

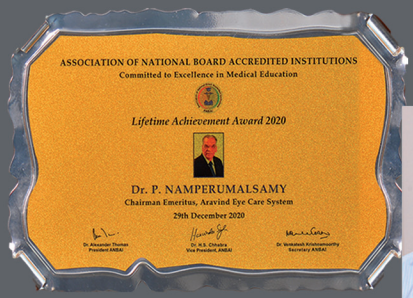
Dr. Kalpana Narendran, Senior Medical Officer, Aravind-Coimbatore was honoured with the Dr. R.N. Gandhewar Oration Award by Vidharbha Ophthalmic Society. Dr. Kalpana delivered the oration titled, *Perspective on paediatric cataract management*.



The Greenberg Prize: End Blindness 2020

FICCI Healthcare Quality Award for Aravind Eye Hospital

Certificate of appreciation to Aravind-Madurai by the Govt. of Tamil Nadu



Dr. P. Namperumalsamy honoured with the Lifetime Achievement Award

FICCI Annual Healthcare Excellence Award - special mention, Aravind-Pondicherry

Award for best innovation for Aravind-Pondicherry by CAHO

Mr. N. Vengadesan during the virtual meet with Her Majesty Queen Elizabeth

Virtual meet with Her Majesty Queen Elizabeth

October 8

Mr. N. Vengadesan of Aravind - Pondicherry was one among the select three young leaders working in eye care, who participated in a video conference with Her Majesty Queen Elizabeth and Her Royal Highness, Countess of Wessex. At this meet which was organised to observe World Sight Day, he briefed the Queen about eye care in India, barriers to access and the need to innovate constantly towards improving the quality of eye care delivery.

Recognised as Health Ambassadors

Ms. E. Sakthi, Co-ordinator, Welfare and Development, Aravind-Madurai and, Ms. S. Swetha, HR Manager, Aurolab were recognized as Health Ambassadors by Dr. Reddy's Foundation for Health Education. The recognition came in appreciation of their role in championing the Foundation's Awareness for Life Initiative at Aravind-Madurai and Aurolab.

ACHIEVEMENTS

Award at the Annual Conference of American Society of Cataract and Refractive Surgeons

May 16-17

Dr. M. G. Pavan Kumar, Glaucoma Consultant, Aravind-Pondicherry became winner in the film festival in the Glaucoma Surgery category for his video titled, *Mission Impossible - MIGS for the Developing World.*

Award at the Annual Conference of the Intraocular Implant and Refractive Society of India

Chennai, July 4-5

- Dr. M.G. Pavan Kumar became winner in the *Best New Producer category* (Film Festival).
- Dr. Prithvi Chandrakanth, Retina Fellow, Aravind-Coimbatore and Dr. V.R. Vivekanandan, Chief, Cataract Services, Aravind-Pondicherry emerged as winner and first runner up *in the Best New Techniques, New Devices and Innovations category* (Film Festival).

Awards at the Annual Conference of Tamil Nadu Ophthalmic Association

- Dr. Pavitra R, MS Resident, Aravind-Madurai, Winner, oral presentation, Category: Cataract/ Cornea/Comprehensive ophthalmology
- Dr. Deepa Chitra D, MS Resident, Aravind-Madurai, Runner-up, paper presentation, Category: Paediatric Ophthalmology
- Dr. Priyanka S, MS Resident, Aravind-Madurai, Winner: E-poster, Category: Uvea
- Dr. Sreeramyaa P, MS Resident, Aravind-Madurai, Runner up: E-poster, Category: Comprehensive ophthalmology
- Dr. Sangavi Samirtha Selvi, MS Resident, Aravind-Madurai, Runner up: E-poster, Category: Vitreoretinal diseases
- Dr. Saranya Settu, Consultant, Paediatric Ophthalmology Services, Aravind-Chennai, Best paper Award, Category: Paediatric ophthalmology and squint

Awards at Keracon – Annual Conference of Cornea Society of India

December 11-13, 2020

- Dr. Ann Divya Jacob, Cornea Fellow, Aravind-Tirunelveli and Dr. Josephine Christy, Cornea Consultant, Aravind-Pondicherry won first and second prizes respectively in the E-poster competition.
- Dr. Aditya Sanjeev Ghorpade, Cornea Consultant, Aravind-Tirunelveli won second place in photo contest.

Video competition by Glaucoma Society of India: World Glaucoma Week

Category: Glaucoma Awareness

- Winner - Dr. M.G. Pavan Kumar, for the video titled *3D Click art exhibition.*
  Category: Counselling for compliance
- Winner - Dr. Kavitha Srinivasan, for the video titled, *Guardians of vision- Prioritizing high risk patients.*
  Special credits: Dr, Usha Tejaswini, Dr. Shivraj Tagare
- Runner Up - Dr. C.R. Vishwaraj, for the video titled, *Uberisation of Eye Care.*
  Special credits: Dr. Apurva Hemant Kumar Nagtode, Dr. M.G. Pavan Kumar, Dr. R. Venkatesh.

Ramalingaswami Re-entry Fellowship

Dr. Anwar Azad Palakkan and Dr. Swagata Ghosh have been awarded with the prestigious Ramalingaswami Re-entry Fellowship by the Dept. of Biotechnology, Govt. of India for 2020 and 2021 respectively. As part of the fellowship, Dr. Anwar will work on the project titled, *Modelling macular degeneration using human pluripotent stem cells for better understanding of disease pathophysiology and to investigate novel therapies.* Dr. Swagat will work on Identification of host immune factors as predictor of severe human fungal keratitis and their utility in disease management.

Aravind Eye Foundation

The Aravind Eye Foundation was founded in 2000 to support Dr. V's mission to eliminate needless blindness and to promote sustainable, high quality, patient-centric eye care around the world. Through a combination of philanthropy, volunteerism, and partnering, the foundation acts as a catalyst for new research and service development and helps scale existing programs. Foundation board members and advisors come from a variety of fields, including clinical care, medical research, accessible technology and new product development, higher education, venture capital, and healthcare management.

Ring of Hope

While Aravind is renowned for its sustainable model of eye care - paying patients subsidise care for our neediest patients - there are some types of treatment that require additional support. Ocular cancer is a blinding, disfiguring, often fatal disease, and treatment can cost thousands of dollars, well beyond the means of most Indian families. In addition, if the patient is the main wage earner, cancer can have a catastrophic impact on the whole family's well-being for generations.

Since it was founded in 2004, the Ring of Hope has saved the sight and lives of 807 patients. More than 10,000 patient visits have been provided free of charge, and 342 patients received custom-made prostheses to improve their appearance and self-confidence.

Successful cures rely on patients being able to return to Aravind for follow-up visits over the course of treatment. The pandemic has made this extremely difficult, yet Aravind found a way. One-year-old Nancy traveled from Andhra Pradesh to Madurai to be treated for retinoblastoma. However, when India went into lockdown, Nancy and her family were stranded far away from home. In addition to treating Nancy free of cost, Aravind also provided Nancy and her family with food and housing until they could safely return to their home.

We are grateful to the Jaya G. Iyer Endowment Fund at the Madison Community Foundation, the Sohum Foundation, the Yvette and Derryck Dias Foundation, Dr. and Mrs. William B. Stewart, and Kamini Murgaboopathy and Pradeep Bhadrachalan for their generous support of the Ring of Hope.

Rural vision centers

Aravind's 91 rural vision centers are on the frontline of eye care in Tamil Nadu, providing affordable primary eye care for more than 8.5 million people. Each center is staffed by two highly trained technicians, who perform examinations, prescribe glasses, and recommend necessary follow-up treatment. In addition, each center is linked to a main hospital through Aravind's tele-medicine system, so every patient "sees" an ophthalmologist during their visit.

The rural vision centers have fulfilled a critical role during the pandemic, allowing people to access care locally and avoid travel. More than 90% of care can be provided by the rural vision centers directly, saving patients time and money. To protect our staff and our patients, the foundation provided PPE (personal protection equipment) to all rural vision centers through a grant from the Allene Reuss Memorial Trust.

Nancy and her family

Patient being treated at a vision center

Inauguration of a vision center in Valapady, in honor of the 50th wedding anniversary of Dr. and Mrs. Alan Robin

Genetic testing for retinoblastoma

Through the generosity of our donors, the foundation has funded 18 rural vision centers. These centers together have handled 720,839 patient visits so far. Often family members will join together to build a center in honor of a beloved parent. We are grateful to the Sudharshan and Robin families for helping to build rural vision centers.

Genetic testing for ocular cancer

With grants from the Allene Reuss Memorial Trust and the Sohum Foundation, in 2013 Aravind established the first genetic testing lab for retinoblastoma outside of North American and Europe, reducing the cost of testing from $2000 to $250 per person. Now in its seventh year, Aravind's genetic testing program covers all ocular cancers.

Testing and early diagnosis is essential to successful treatment for all eye cancers and to saving sight and life. We give thanks to the Jaya G. Iyer Fund at the Madison Community Foundation and the Sohum Foundation for their generous support to expand the genetic testing program and to offer hope to all patients suffering from ocular cancer.

Spectacles for scholars

School children with untreated vision impairment fall behind their peers in academic achievement, according to the World Health Organization, and this can have a lasting effect on future employment and economic progress. In collaboration with eyewear brand Warby Parker, Aravind has provided free vision screening and eyeglasses to nearly 34,000 school children between the ages of 5 and 17 since 2016. This year Aravind screened 52,857 children and provided 2,214 pairs of eyeglasses.

Capacity building

Aravind continues to share its sustainable model of eye care with other eye care professionals and hospitals around the world. With travel severely restricted, Aravind turned increasing to tele-training and tele-ophthalmology to fulfill its mission. Thank you to the Conrad Hilton Foundation, the Johns Hopkins University Bloomberg School of Public Health, and the Lavelle Fund for the Blind who have provided multi-year grants to support Aravind's internal and external capacity building, and to the Cornell University Management Consulting Club for their research into telehealth best practices.

In gratitude

The Covid-19 pandemic has created unprecedented challenges to eye care organizations around the world, as well as inspiring opportunities for compassion and innovation. More than ever, we feel the guiding light of our founder, Dr. G. Venkataswamy, who taught us that we must leave no one behind in our efforts to end needless blindness. We are deeply grateful to the institutional and individual donors who made extraordinary gifts to support our staff and our patients during this time.

"To see all as one. To give sight for all"
(From the journals of Dr. G. Venkataswamy)

ARAVIND EYE FOUNDATION

Partners in Service

Aravind expresses its sincere gratitude to organisations and individuals for their contributions in its mission of restoring sight. The organisation acknowledges their unstinting support and looks forward to a continuing journey of fruitful collaboration.

For service delivery, training and more

- *Alcon Laboratories Inc, USA*
- *Aravind Eye Foundation, USA*
- *Bosch India Foundation, Bengaluru*
- *Carl Zeiss Meditec, Germany*
- *CBM International, Germany*
- *Combat Blindness Foundation, USA*
- *Conrad N. Hilton Foundation, USA*
- *Dana Center, Johns Hopkins University, USA*
- *Dr. Shroff's Charity Eye Hospital, New Delhi*
- *Eicher Group Foundation, New Delhi*
- *Essilor, India*
- *Fred Hollows Foundation, Australia*
- *Indian Overseas Bank, India*
- *International Agency for Prevention of Blindness, UK*
- *Kaushal Devendra Gupta, Pune, India*
- *Lavelle Fund for the Blind, USA*
- *Lions Clubs International Foundation, USA*
- *London School of Hygiene & Tropical Medicine, UK*
- *Manohar Devadoss, Chennai, India*
- *Mehra Eyetech Private Limited, Puducherry*
- *Novartis, Switzerland*
- *ORBIS International, USA*
- *Rotary International, USA*
- *Schwab Foundation and Social Entrepreneurship, Switzerland*
- *Seva Canada*
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- *Shyam Prakash Gupta, Madurai, India*
- *SightSavers, UK*
- *State Bank of India, India*
- *Standard Chartered Bank & Scope Intl., UK*
- *So-Hum Foundation, USA*
- *Subroto Bagchi, Odisha, India*
- *The Tamil Nadu Dr. MGR Medical University*
- *Tirumala Tirupati Devasthanams, India*
- *TOMS, USA*
- *Topcon, Japan*
- *Tulsi Chanrai Foundation, Nigeria*
- *University of Michigan, USA*
- *USAID, USA*
- *VISION 2020 - The Right to Sight, India*
- *Wescott Williams Ltd., UK*
- *World Diabetes Foundation, Denmark*
- *World Health Organization, Switzerland*
- *XOVA: Excellence in Ophthalmology Vision Award, USA*

For research

- *Alagappa University, Karaikudi, India*
- *Aravind Eye Foundation, USA*
- *Bascom Palmer Eye Institute, USA*
- *Beaumont Hospital, Royal Oak, Michigan, USA*
- *Boston Children Hospital, Boston, USA*
- *British Columbia center for epidemiologic and international Ophthalmology, UBC, Vancouver, Canada*
- *Casey Eye Institute, Oregon Health & Science University, Portland, USA*
- *Cognizant Foundation, Chennai, India*
- *Cornell University, Ithaca, USA*
- *Council of Scientific and Industrial Research, New Delhi, India*
- *Department of Biotechnology, New Delhi, India*
- *Department of Health Research, New Delhi, India*
- *Department of Science and Technology, New Delhi, India*
- *Duke University, USA*
- *Geisel School of Medicine at Dartmouth, Dartmouth*
- *Google, Mountainview, CA*
- *Harvard Medical school, USA*
- *Hitchcock Medical Center, Lebanon NH, USA*
- *India Alliance, Hyderabad, India*
- *Indian Council of Medical Research, New Delhi, India*
- *Indian Paediatric Glaucoma Interest Group (IPGI), Chandigarh*
- *Indian School of Business, Hyderabad*
- *Johns Hopkins University, USA*
- *Kellogg Eye Center, University of Michigan, USA*
- *King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia*
- *Kovai Medical Center and Hospitals, Coimbatore.*
- *London Business School, UK*
- *Madurai Kamaraj University, Madurai, India*
- *Maastricht University, Netherland*
- *Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston MA*
- *Michigan State University, USA*
- *Moorfields Eye Hospital, London*
- *National Eye Institute, USA*
- *National Healthcare Group Eye Institute, Tan Tock Seng Hospital, Singapore*
- *National University of Singapore, Singapore*
- *Neuroptics Research Laboratory, Berkeley, USA*
- *Peninsula Eye surgery centre, Los Altos, CA*
- *Pondicherry University, Pondicherry, India*
- *Postgraduate Institute of Medical Education and Research, Chandigarh, India*
- *Proctor Foundation, University of California, San Francisco, USA*
- *Public Health Foundation of India (PHFI), Gurgaon, Haryana*
- *Queens University Belfast, UK*
- *Remidio Innovative Solutions, Bengaluru, India*
- *Stanford University, USA*
- *Sastra University, Thanjavur, India*
- *Science and Engineering Research Board, New Delhi, India*
- *Seva Foundation, USA*
- *Singapore Eye Research Institute, Singapore National Eye Centre, Singapore*
- *Singapore National Eye Centre, Singapore*
- *State University of New York (SUNY), Buffalo, New York, USA*
- *Sun Pharma, Mumbai, India*
- *Tufts School of Medicine, Boston, Massachusetts, USA*
- *Unite des Aspergillus, Institut Pasteur, Paris*
- *University College, London*
- *University of California, Berkeley, USA*
- *University of California, San Francisco, USA*
- *University of Edinburgh, UK*
- *University of Illinois, Chicago,USA*
- *University of Liverpool, Liverpool, UK*
- *University of Michigan, USA*
- *University of South Florida, USA*
- *University of Texas South Western, Medical Centre, Dallas.*
- *University of Ulster, Northern Island, UK*
- *Vision Research Foundation, Sankara Nethralaya, Chennai, India*
- *Wellcome Trust, UK*
- *Wills Eye Hospital, Philadelphia, USA*
- *World Health Organization, Switzerland*

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A. Subbulakshmi

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