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South Asia Edition

Refraction being performed at a vision centre. INDIA
DR. SRINIVAS MARMAMULA/LVPEI

Myopia: an emerging public health challenge in South Asia

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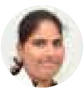

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Uncorrected refractive errors (URE), predominantly myopia, remain the leading cause of vision loss worldwide including in South Asia.

Vision impairment (VI) is a global public health challenge that affects an estimated 253 million people.[1] Uncorrected refractive errors (URE), predominantly myopia, remains the leading cause of vision loss worldwide including in South Asia (SA).[2] Myopia or near-sightedness, is a refractive error, a condition in which the eye does not bend or refract light properly. This means that while close objects look clear, distant objects look blurred. Myopia is measured in dioptres, however the magnitude varies across the studies.

According to projections reported by Holden et al it is estimated that URE - and mainly myopia - was the most common cause of distance vision impairment affecting over 108 million people worldwide in 2010.[3]

A recent meta-analysis reported a global prevalence of myopia (spherical equivalent of 0.50 D or less myopia) as 20.2% in year 2010 and is projected to increase to 28.6% by year 2020 and 53% by year 2050.[3] It is also estimated that by 2050, 50% of the global population will be myopic and 10% will have high myopia.[3] It is evident that myopia is an emerging public health challenge that needs to be addressed worldwide.

The South Asia region comprises of eight countries, including India, Pakistan and Bangladesh, the three of the 10 most populated countries in the world. The region hosts 23% of the world population and shares a disproportionately large burden (30%) of global VI.[1] While URE contributes to 50% of the global VI, in this region it is as high as 63%.[2]

About this issue

Myopia, or shortsightedness, is a major public health problem in South Asia. As low- and middle-income countries become more urbanised, the myopia 'epidemic' is likely to spread. This issue looks at ways to prevent and manage myopia and minimise its impact in the region.

Contents

Myopia in children and young adults in SA

The Refractive Errors Studies in Children (RESC) reported a higher prevalence of myopia in children from urban India (Delhi) compared to rural India (Mahbubnagar). The prevalence of refractive errors in rural Nepal was the least (1.2%). This two-to three-fold higher prevalence of myopia in urban children is predominantly due to increased near work activities. A recent longitudinal study conducted among children in India revealed that increased near-work activities such as reading and writing per week, excessive use of electronic gadgets such as computers, tablets, video games and watching television were significant risk factors for progression of myopia.[4] The same study also revealed that outdoor activities or time spent outdoor (>2 hours) were protective against progression of myopia. There is also evidence from studies done in other regions of the world showing increased outdoor activity to have a protective effect on onset and progression of myopia. An increase in outdoor activities for children and a restriction on screen-time can be a useful public health intervention for myopia in this region.

Myopia in older populations

The prevalence of myopia in older adults is highly variable in the region ranging from close to 20% in central India to 43% in Myanmar. This large variability is due to several factors including the age of the participants and other risk factors such as ethnicity. Some myopia in the older age groups may be due to nuclear cataract (cataract in the central zone (nucleus) of the lens). A good cataract surgery programme will be able to address myopia caused due to cataract.

Models for correcting myopia in SA

Addressing the myopia challenge in SA needs a multi-pronged approach based on early detection and appropriate correction. As school children form a captive group, school-based eye health programmes or camps can detect myopia in children and

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provide appropriate correction. Community-based screening programmes (CSP) are often conducted by non-government organisations in this region. The CSPs are conducted as "make-shift clinics" set-up in areas where limited eye care services are available. All those visiting these clinics are screened for vision impairment. Those with refractive errors are provided spectacles and those with uncorrectable vision loss are referred to a base hospital where services including cataract surgery are provided. The Vision Centre (VC) model of primary eye care service delivery has evolved in India and now spread to other countries with relevant local modifications.

Modalities for correcting myopia in SA

Myopia is considered as a correctable form of vision loss. Spectacles remain the mainstay for correction of myopia in the SA region. However, with new technological innovations and more predictable outcomes, refractive surgery is increasing especially in urban areas. Recognising the importance of preventing the progression of myopia, several modes of prevention are being tried. Orthokeratology (ortho-k) reverse geometry contact lenses are one such modality. These contact lenses worn overnight temporarily aim to reshape the corneal surface. Pharmacological interventions to reduce myopia and axial elongation have been evaluated in a few studies.

This issue of the South Asia edition will provide a comprehensive review of myopia in the SA region. Ravilla et al provide an overview on spectacle dispensing at the community level. Acharya et al describe the current trends in surgical options for correction of myopia. Murthy et al describe the models of myopia correction at a population level. Verkicherla et al highlight new promising technologies and artificial intelligence in early detection and management of myopia in the region. These models for correction of myopia and application of innovation and technology to address the myopia challenge are also presented.

DR SRINIVAS MARMAMULA/LVPEI

Dispensing spectacles at a vision centre. INDIA

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The authors wish to thank Shashank Yellapragada and Dr Rohit C Khanna for contributing to this article.

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Spectacle dispensing for myopia at primary eye care level

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Primary eye care services must include refractive error assessment and spectacle dispensing.

ARAVIND EYE CARE SYSTEMS

Spectacle dispensing at a rural Aravind eye camp. An optician helps patients choose from a selection of frames while technicians select the prescribed lenses, edge and fit them. INDIA

The prevalence of myopia has been progressively increasing[1,2,3] and is due to changes in lifestyle or reduced outdoor activity. Myopia is easily corrected with a pair of spectacles. However, lack of access to refractive assessment and availability of spectacles remain the key challenge in addressing uncorrected refractive error.[4] Primary eye care services are best positioned to create and sustain such accessibility. Well-designed primary eye care can provide the required refractive correction for the community.

These services need to be comprehensive and include not only refractive assessment and prescription, but also, spectacle dispensing. It has been noted that making spectacles available on the spot is important to ensure uptake and use.[5]

This article discusses guidelines for how myopia correction can be provided at the community level through outreach camps and primary care centres. To make spectacle dispensing available, we need to have systems in place to provide the right inventory of lenses and the right kind of frames stocked to ensure uptake and patient satisfaction.

Guidelines for prescribing glass

Glasses need to be prescribed based on the individuals' needs and symptoms. Most practioners prescribe spectacles for a refractive error of −0.7 DS and less only if the patient is symptomatic.[6] Spectacles should be prescribed based on the patient's subjective refraction and not merely retinoscopy findings. Those with presbyopia may be given the option to remove their myopia glasses for reading or use bifocals.

Cycloplegic refraction is recommended when prescribing glasses for the first time especially in children less than 15 years of age. The AAO paediatric ophthalmology panel recommends prescribing glasses for myopia of:

- 5.0 DS or more in infants,
- 4.0 DS or more in children between one to two years of age
- 3.0 DS or more in those between two to three years of age and
- 2.5 or more in children over three years of age.[7]

Spectacles need to be prescribed for even lower refractive errors in those with anisometropia.

Guidelines for dispensing spectacles

While dispensing spectacles, it is important to take into account the patients need, vocation and socio-economic background. Opticians need to guide patients to choose appropriate frames. Frames that are too large can slip down the nasal bridge and could disturb the alignment of optic centre of the lenses to the patients' pupil. In younger children, plastic frames and plastic lenses are recommended to avoid injury to the eye if the spectacles break.

- Plastic lens (CR 39) has the advantage of being safe and more durable. However, the edging and fitting of these lenses need more sophisticated equipment which is neither suitable for portable use nor feasible for a small scale of operations. Also, as these lenses tend to yellow over time, they cannot be stocked for long periods. Plastic lenses are available with additional features such as anti-reflection, UV protection, scratch resistance, high refractive index lenses etc.
- Glass lenses are cheaper, easier to process and are less prone to scratches; although they are heavier and can break more easily. Glass lenses are used for eye camps as they are less expensive and can be edged by hand using a portable edging machine.
- For patients with high myopia, lenses with high refractive index are thinner and give a better cosmetic result. They are available both in plastic and glass and are best if dispensed with anti-reflection coating.
- Polycarbonate lenses are recommended for children for safety but they are more expensive; these are especially recommended for those who are one-eyed and need spectacles for protection.

Spectacle dispensing in outreach camps

Outreach camps are designed to include a refraction assessment as part of the standard clinical examination. On-the-spot dispensing of spectacles at the campsite ensures uptake and use of spectacles. Often 15-25% of the patients at a camp will require spectacles and the lens inventory stock must be planned accordingly and at affordable prices. Refraction camps conducted at workplaces are a good way to address uncorrected refractive error in the working age group. As the number of patients who require spectacles is around 35% in these camps, a larger inventory needs to be planned.

Patients are offered a choice of spectacle frames to choose from. A standard inventory of ready-made lenses has been developed for different sized camps. Ready-made lenses in common power ranges are easily available in the market. Usually this can cater to about 90% of the prescriptions. Lenses for high powers, mixed astigmatism and hyperopic astigmatism are rarely required and hence not stocked – these are made to order against a prescription and couriered to the patient. This arrangement can ensure an increased spectacle uptake of about 80% among those who are given prescriptions.[9]

Spectacle dispensing at primary eye care centres

Primary eye care services must include refractive error assessment and spectacle dispensing. A simple way to provide spectacles is to offer a range of spectacle frames and outsource edging and fitting of the lenses. At Aravind Eye Care System in India, a network of primary eye care centres or vision centres are linked to the central spectacle processing unit at the base hospital.

These VCs are manned by two vision technicians. Patients receive a comprehensive eye examination including refractive evaluation and consult with an ophthalmologist using telemedicine. Each VC carries a standard display of about 80 frame models of varying colours, models and sizes, besides a small inventory of reading glasses. An online ordering system conveys the choice of frame, lens type and prescription details to the central spectacle processing unit. This allows the patient to have the choice of ordering plastic lenses. Spectacles are delivered to the patient within one to three days. This ensures over 90% uptake of spectacles and spectacle sales contribute over 60% of these centres' income.

ARAVIND EYE CARE SYSTEMS

The right frame will ensure proper alignment of the optic centre of the lens to the patient's pupil. INDIA

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What do you need to dispense spectacles at an outreach camp?

For an average of 200 camp patients

- 30-40 patients expected to be prescribed spectacles
- Inventory:
  - Presbyopic glasses: 25
  - Frames: 80
  - Lenses: 300 (varying powers)
- Human resources: two opticians for sales and fitting
- Equipment: lens markers, chipper, cutter, lens edger, screwdrivers, frame warmer, adjustment pliers
- Percentage of on the spot delivery: 85%

Current trends in surgical management of myopia

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We describe various surgical options for correction of myopia, the advantages and disadvantages of the procedures, current practices and emerging trends.

Over the last few decades, refractive surgery for treatment of myopia has gained popularity as both a cosmetic procedure to avoid spectacles and as a means of complying with occupational vision standards. Refractive surgery procedures include:

- Incisional refractive surgery
- Excimer laser refractive surgery and
- Intraocular surgery

Incisional refractive surgery

The first report of using an incision to alter the shape of the human cornea was in the 19th century, when Schiotz[1] used a limbal relaxing incision in a patient who underwent cataract surgery. In the 1980s Radial Keratotomy (RK) was used to treat thousands of patients with myopia with good predictability; however complications including infection, weakening of the cornea and night vision problems has made RK a more or less obsolete procedure for myopia management.

Excimer laser refractive surgery

This consists of mainly surface ablation techniques and Laser In Situ Keratomileusis (LASIK). Surface ablation includes:

- Photorefractive keratectomy (PRK)
- Laser subepithelial keratectomy (LASEK) and
- Epithelial laser in situ keratomileusis (epi-LASIK, commonly referred to as LASIK)

In PRK, the epithelium is removed either mechanically by scraping it with a blade or chemically by using a diluted solution of ethanol. In the latter approach the epithelial sheet is not repositioned after laser ablation.
In LASEK the epithelial flap is repositioned gently over the ablated tissue.

Figure 1 Surgeon performing LASIK surgery.

An alternative surgical procedure to separate the epithelium mechanically by using an epi-keratome was introduced by Pallikaris et al in 2003.[2] The technique is widely known as epi-LASIK.

Comparative studies of surface ablation techniques (PRK versus LASEK) have shown similar refractive outcomes. These procedures work best for myopia up to 6D (Dioptres). Laser surface ablation is a better option than epi-LASIK in patients with epithelial irregularities, dry eye syndrome, thin corneas, patients with possible risk of post epi-LASIK flap dislocation and in patients with possible risk of keratectasia.

Laser In Situ Keratomileusis

epi-LASIK is currently the most popular surgical option for myopia correction. It is superior to PRK in terms of patient comfort, visual stabilisations and stromal haze formation. It was first popularised by Pallikaris[3] and Buratto[4] as a technique of laser ablation of the corneal stroma, which involved the creation of a flap of anterior stroma

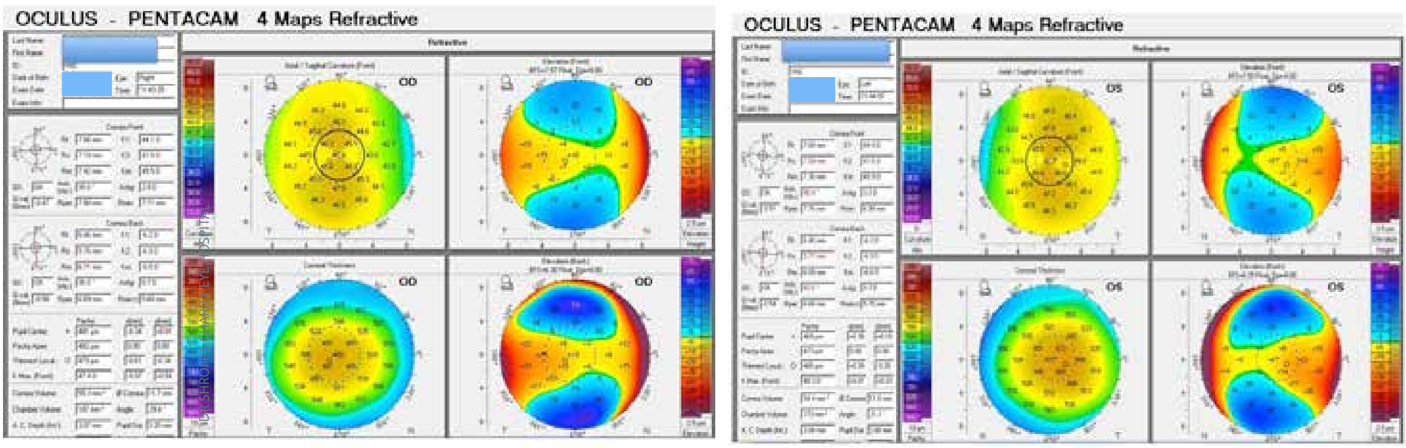

Figure 2A & B Pentacam image of right and left eye, performed in the pre-operative workup period

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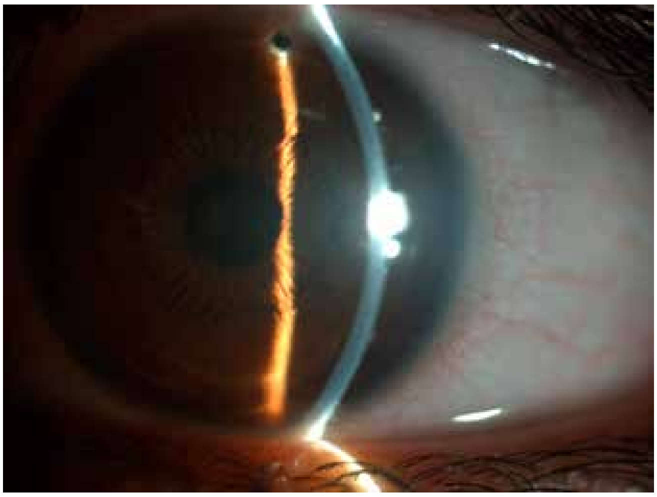
Figure 3 Refractive lens exchange (RLE)



DR SHROFF'S CHARITY EYE HOSPITAL

Figure 4 Implantation of a Phakic Intraocular Lens (pIOL)

including Bowman's and epithelium with the aid of a microkeratome. It can be used to treat up to 15.0 D of myopia, however due to risk of long-term ectasia, the recommendation has been revised to a maximum of minus 10.0 D (Figure 1).

As with any other surgery, epi-LASIK also has its own share of complications; these include - free flaps, buttonhole flaps, irregular flaps and post epi-LASIK traumatic flap displacement; epithelial ingrowth, dry eye syndrome also need to be kept in mind.

Recently, Wavefront-guided epi-LASIK is being used to preserve the asphericity of the cornea, thus inducing less spherical aberration compared with standard epi-LASIK (Figure 2A and B).

Intraocular surgery

For very high degrees of myopia (more than minus 10.0 D), epi-LASIK is unpredictable and runs a risk of regression and ectasia. Refractive lens exchange (RLE), also known as clear lens extraction, was first described by Fukala in 1890, as one of the options to treat high myopia (Figure 3).[5] The availability of a wide range of lens powers both for sphere and cylinder have made this approach more attractive when epi-LASIK is contraindicated. This procedure is best suited for treating high myopia up to myopia -23.0 D, or in other myopes where optical correction or refractive surgery is contraindicated. Even though good refractive outcomes are reported, high myopes run a risk of retinal detachment after surgery, a complication that the patients should be counseled about. Implantation of a Phakic Intraocular Lens (pIOL) can also be considered (Figure 4).

Recent advancements

These days, Femtosecond lasers[6] (IntraLase, Irvine, California, USA) have been reported to create more accurate and thinner flaps resulting in more predictable results. The flap dimension can be adjusted based on the needs of patient and the type of excimer laser used. This also aids in faster recovery, and reduces the risk of further corneal problems.

Lastly, the most recent addition to this list is that of SMall Incision Lenticule Extraction (ReLEx® SMILE) which is a minimally invasive procedure, and combines the advantage of both PRK and epi-LASIK - flapless and fast recovery.[7] During this procedure, an intrastromal lenticule is created, and is removed from a small 2-3mm tunnel incision. Since 2011, when the procedure started in Europe, China and India, it has proved to be ideal for individuals with active lifestyle/ occupations with a risk of trauma to head or eyes and for those whose are predisposed to chronic dry eye.

Surgical options for refractive errors have come a long way since 1990. In a field like ophthalmology, which is majorly dependent on technology, we only expect the treatment options to become more sophisticated and patient-friendly in the coming years.

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Models for correction of myopia in South Asia region

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Models for correction of myopia need to target identification and correction of those with myopia on the one hand and interventions for modifiable factors to prevent onset and slow down progression on the other.

The prevalence of myopia is increasing in South Asia with earlier onset and high progression rates. Among school-aged children, population studies indicate a prevalence of myopia of (<= -0.5 D) ranging from 1.2–7.4% while school-based studies indicate a higher prevalence between 6-10% in the South Asia region.[1] Among adults, prevalence rates have varied from 17% to 42.7% (<-0.5 D).[2]

Models for correction of myopia need to target identification and correction of those with myopia on the one hand and interventions for modifiable factors to prevent onset and slow down progression on the other. The modifiable factors are mostly related to nurture. Controlling the modifiable factors is also dependent on whether it is at a clinic level or at a programme level. Some interventions such as use of pharmacologic agents like low-dose atropine are more suited for clinic-based interventions (e.g. percentage (%) atropine drops instilled in the eye every alternate day), while others encourage children to spend more time outdoors (e.g. spending the recess time outside the class room for up to 11 hours a week) have a significant public health approach.

In the South Asia region where prevalence among children is low it is operationally pragmatic to integrate such activities into overall physical health improvement to reduce the risk of obesity, non-communicable diseases like diabetes, along with reducing the risk of myopia. Such optimisation has comprehensive benefits which also impact vision and can be offered at a more affordable cost. Cost effectiveness of interventions needs to be carefully considered especially when prevalence is low. In such a context searching for myopia alone increases the cost of care compared to integrating vision screening in school health screening programmes.

South Asia has been the cradle of innovation in eye care. School vision screening programmes have been in vogue, especially in India for more than three decades while comprehensive school health screening, including vision and hearing has been established for more than 60 years.

Programme models for myopia

Models for myopia correction can be categorised by population age

- 5–17 years
- 18–39 years
- 40+ years

Some models cater to all ages at the same time as is done in a population-screening camp model; this approach is opportunistic. Those aged 18–39 years, when symptomatic may attend an eye care facility that includes an optician for their vision correction. It is probably not efficient to organise an activity exclusively for this group as the numbers will be low unless it is done as part of occupational health in factories and work places.

ANUGRAHA DRISHTIDAAN/IAPBEYECAREEVERYWHERE

Villagers collecting their spectacles after eye check-up. INDIA

Models for older populations

Evidence shows that 70% of older age adults with myopia have cataract[4]; therefore the focus of any programmatic intervention for myopia should be a comprehensive eye service so that the underlying pathology can be managed effectively. Modalities like vision centres or comprehensive eye screening camps are appropriate options for this age group. Such an approach also ensures that people who are prescribed and dispensed spectacles do not go away with the notion that this 'rectifies' their underlying pathology. Additional challenges in this group is the loss to follow up and compliance with treatment advice.

Models targeting children

The significant population segment that can benefit from a programmatic approach to myopia are school-aged children. In most countries of South Asia, school enrollment rates have increased significantly over the past two decades, except in difficult geographical terrain. When more than 80-90% of children are in schools, it is logistically pragmatic and efficient to search for children with myopia in schools. Studies have shown that the prevalence of myopia is insignificant below the age of five years and increases between 11 to 15 years. This epidemiologic characteristic has led to the rationale of targeting children in grades five to 10 for school vision screening programmes.

Identifying children with myopia

School eye screening programmes prioritise myopia detection as it is the most prevalent refractive error in this age group. Most of the studies both globally and in the South Asia region observed that the prevalence of childhood myopia is significantly higher in urban environments.[3,4] This could be related to life-style factors and early exposure to near-work and parental pressure on academic achievements. Therefore the first priority in South Asia is children aged 11+ in urban schools as they have a higher risk of myopia.

Integrating vision screening in a school health programme is a cost-effective sustainable approach compared to a stand-alone vision screening. In India the commonest approach has been training school teachers to do the initial vision test, followed by referral of those with 'suspected abnormal vision' to an ophthalmic assistant or optometrist. In some areas, all the school teachers have been trained so that the class teacher can undertake the screening. This is thought to improve compliance as the students are more comfortable with their regular teacher. Another approach involves trained ophthalmic personnel screening the children at school. This is not an affordable approach as there is a paucity of skilled eye care personnel in most of South Asia. Models have also been developed to reach school dropouts and out-of-school children in India.

In all these models, the essential parameter for success is provision of spectacles. If this is not part of a vision 'screening' initiative the entire exercise is futile. The modality of providing spectacles differs from one initiative to another. Most commonly, children are prescribed correction and this is provided through a designated optician. Some organisations dispense spectacles on the spot. Since wearing spectacles is a stigma in South Asian cultures, measures to improve compliance include provision of an array of colorful frames, and more recently, the use of smartphone-based screening (PEEK school eye health) where screened children, their guardians and teachers are shown a simulated sight on the smart-phone.[5]

NOBLE SEBASTIAN, IAPB #MAKEVISIONCOUNT

Children being screened at school. INDIA

Prevention of myopia

Since environmental risk factors have been postulated to be responsible for significant increases in myopia there have been attempts to 'modify' this risk. Time spent outdoors and away from near work activities in a class room has been found to reduce the risk of myopia development and progression of myopia. Large scale trials of prevention have not been done in South Asia but outdoor activity is a promising intervention as it has a positive effect not only on myopia but also on reducing obesity and the risk of non-communicable diseases in later life. The use of pharmacologic agents like low-dose atropine are not warranted as a public health measure in South Asia where the prevalence of childhood myopia is low. It may however find use in a clinical setting when parents are willing to accept the option.

INDRAKUMAR/IAPBSTRONGERTOGETHER

Identifying children with myopia. INDIA

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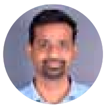
Technology and myopia

From mobile diagnostic devices to electronic medical record (EMR) systems, digitisation and artificial intelligence in eye care are fast evolving in South Asia.



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The use of technology has become integral to healthcare delivery globally. From mobile diagnostic devices for identifying causes of visual impairment to the electronic medical record (EMR) systems, digitisation is fast evolving in South Asia.

The EMR system can collect large datasets ("big data") that are characterised by the four 'V's - volume, variety, velocity and veracity.[1] Refractive error data conform to all of the four criteria. Uncorrected refractive error is a major cause of visual impairment globally. The use of large datasets has the potential to understand the natural history of myopia at a population level. The advent of cloud technology enables aggregation, analysis and application of machine learning (ML) algorithms on large datasets from many hospitals.

Big data and machine learning models will help identify those children at risk of developing high myopia/ pathological myopia. However, the true potential of big data is still to be unlocked. Development of a machine learning model for predicting the progression of refractive error or myopia progression (aged between zero and 25 years) over a period of two years, following their first visit is in progress at the L V Prasad Eye Institute.

The summary of artificial intelligence pipeline is given in Figure 1. The first step of the process is digitisation through EMR systems that includes variables such as age, gender, visual acuity, ocular diagnosis, and refractive error i.e. sphere, cylinder and axis for the prediction of myopia progression. The dataset is analysed with a machine learning (ML) model using gradient boosted tree regression, which is integrated into the EMR system through the cloud. Clinical validation of the ML model for prediction of myopia progression within an error range of 0.25 D is currently on-going.

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Open-field auto-refractor to determine peripheral refraction. INDIA

Recent advancements in instrumentation

Research studies indicate that the risk factors for myopia can be classified into the following categories:

- genetic (both parents with myopia),
- optical (relative peripheral hyperopic refraction),
- structural (choroid, sclera in periphery, distorted or steeper retinal shape) and
- environmental factors (time spent outdoors and light exposure)[2]

Most of the instruments that determine either optical or the structural changes in the eye are designed to measure only the on-axis parameters. There is some evidence[3] showing the importance of the peripheral retina in the genesis of myopia and thus triggering for modifications/customisations to the existing commercial systems to counter myopia progression based on measurements from peripheral retina. "Open-field" auto-refractors, unlike the regular auto-refractors, enable the fixation target to be placed in peripheral locations in the visual field to determine peripheral refraction. This technology has been used to assess peripheral refraction up to 30 degrees along horizontal and vertical meridian.[4]

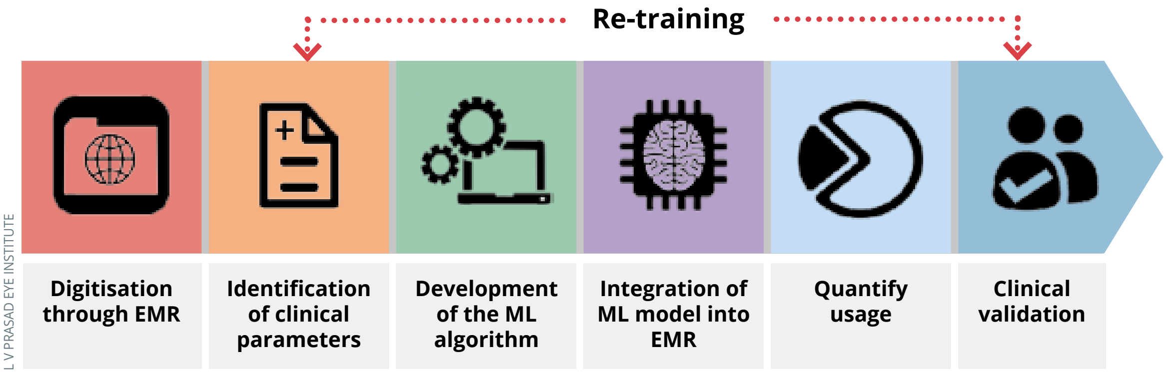
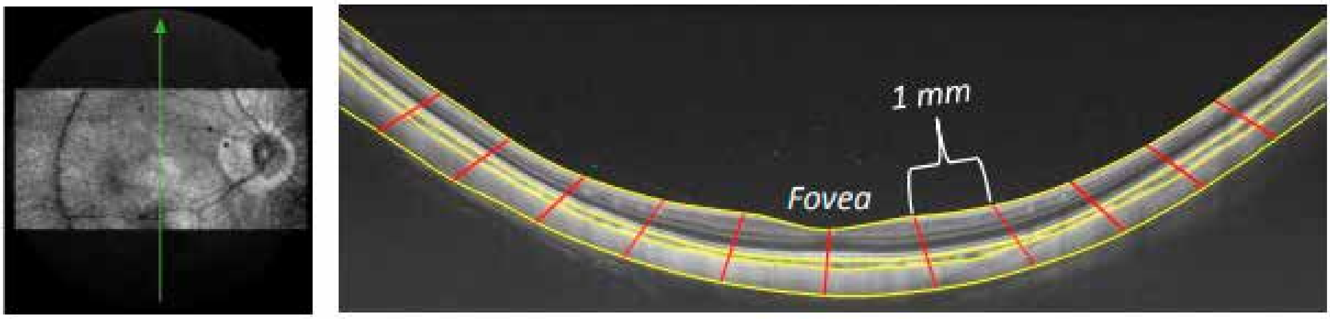


Figure 1 AEye pipeline for the application of machine learning models.



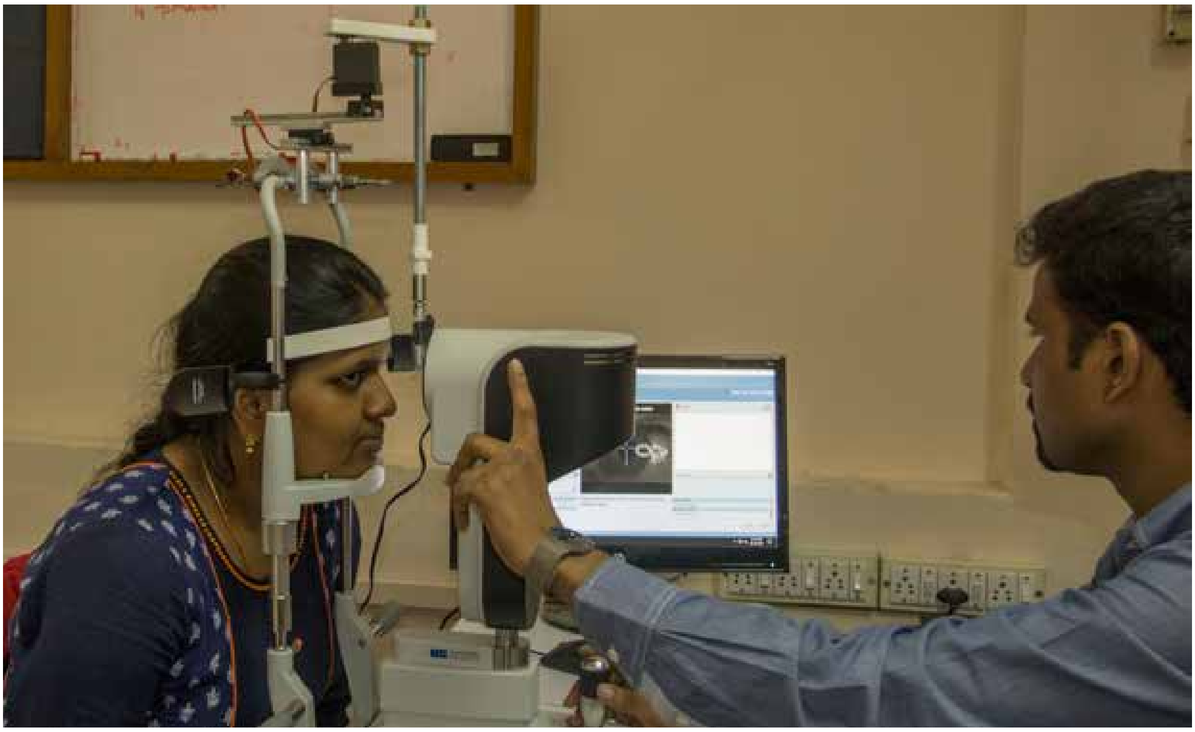
L V PRASAD EYE INSTITUTE

En-face image of retina (left) and segmented B-scan image of posterior ocular coats i.e. retina, choroid and sclera at different eccentricities (right). INDIA

Imaging algorithms have been developed using optical coherence tomography (OCT) to determine choroidal thickness and scleral thickness in different eccentricities along different meridians.[5] Research is underway to identify any early signs in the periphery of the eye that can act as a marker for myopia/high myopia/pathologic myopia.

With regards to the environmental factors, in the last few decades, children were found to spend more time indoors with electronic gadgets and less time outdoors. Recent evidence from animal models and human studies indicate that time spent outdoors could be a modifiable risk factor for myopia development.[5] This has led to development of wearable light sensing devices to quantify the amount of time spent outdoors and motivate children to increase this time.[6]

Emerging technologies that quantify risk factors for myopia present an opportunity to understand myopia progression and management. Customised open-field auto-refractors, state-of-the-art OCT image processing and machine learning algorithms can create a platform for characterising myopia and help in accurate prediction of its progression.



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Instrument setup for peripheral eye length measurements and eye shape. INDIA

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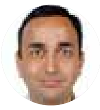
Evidence for managing quality and financial health for sustainability



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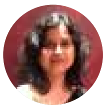
Executive Director: Dr. Shroff's Charity Eye Hospital, New Delhi, India



Suneeta Dubey
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Deepika Verma
Quality Manager: Dr. Shroff's Charity Eye Hospital, New Delhi, India

Quality improvement (QI) initiatives should be based on sound evidence to be effective since human resources, efforts and a lot of time is invested into the process.

Continuous quality improvement is crucial for patient satisfaction. INDIA

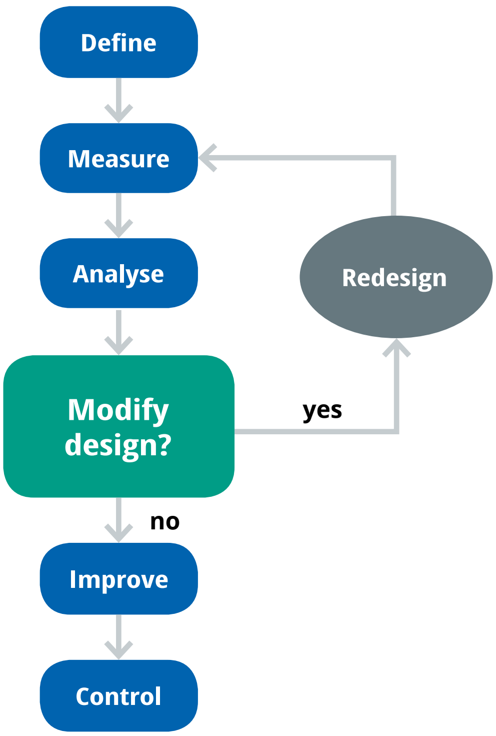
ARAVIND EYE CARE SYSTEMS

Continuous quality improvement is crucial for patient satisfaction which subsequently leads to financial viability. Quality improvement (QI) initiatives should be based on sound evidence to be effective since human resources, efforts and a lot of time is invested into the process. Also, quality improvement processes affect the financial health of an organisation.

Sackett et al defined evidence-based medicine (EBM) as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients, integrating individual clinical expertise with the best available external clinical evidence from systematic research".[1] There are two key aspects of this evidence base:

- Quality improvement initiatives should lead to improvements in patient outcomes that are, ideally, both clinically important and cost-effective.[2]
- Quality improvement initiatives should be based on sound evidence of what works to implement these products or approaches.[3]

Figure 1a DMAIC strategy



Evidence-based quality improvement (EBQI) requires an evidence-based problem that needs assessment. Also, guidelines governing the process to be improved are essential and there has to be sufficient relevant evidence regarding potential methods for improvement (barriers/facilitators, care models). A team of experts is needed for the propagation of EBQI. EBQI aims to systematically insert evidence, knowledge, and data at all points in development of a QI intervention.

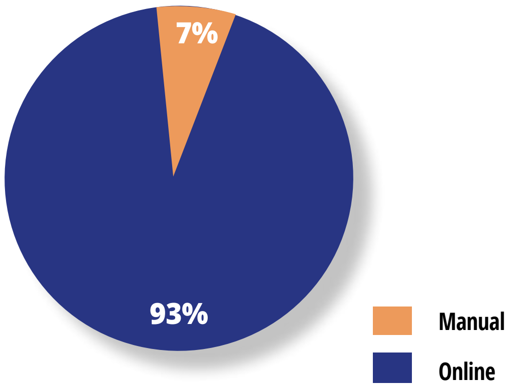
In a reputed National Accreditation Board for Hospitals (NABH) accredited eyecare hospital in North India various EBQI measures are taken in a continuous manner.

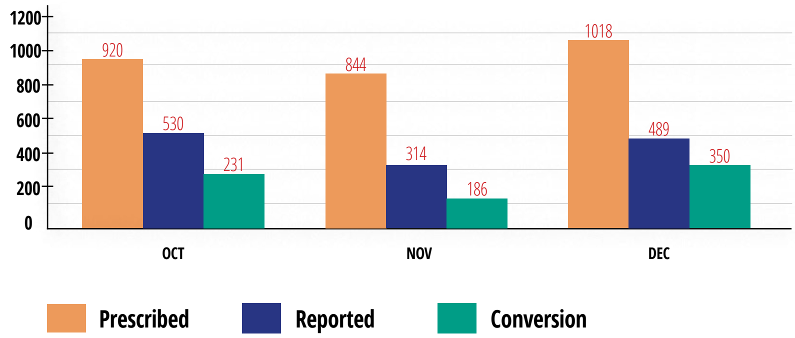
A set of quality indicators (quantitative measures that can be used to monitor and evaluate governance, management, clinical, and support functions) are monitored in the hospital regularly (Table 1) which describe the patient or health related outcomes and performance. Through the indicators based on evidence based standards of care, it is evaluated whether patient care is consistent. Every month the top management holds a meeting with the key stakeholders where

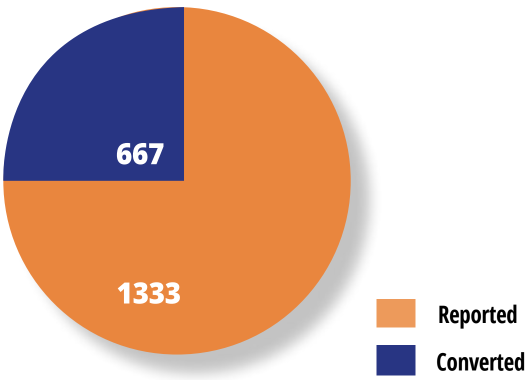
Table 1 Quality indicators monitored regularly

- Patient satisfaction rate (benchmark= 95%)
- OT starting time (benchmark=90%)
- Inter operative time (benchmark= < 10 minutes)
- Post-operative infection rate (benchmark= <0.08%)
- Surgical scrubbing rate (benchmark= 100%)
- Surgical conversion rate (benchmark= 80%)
- Postponed cases (benchmark= 4%)
- OPD starting time
- Medical records completion rate
- Cataract outcomes
- Surgical complication rate

Percentage of prescriptions







Optical conversion rate

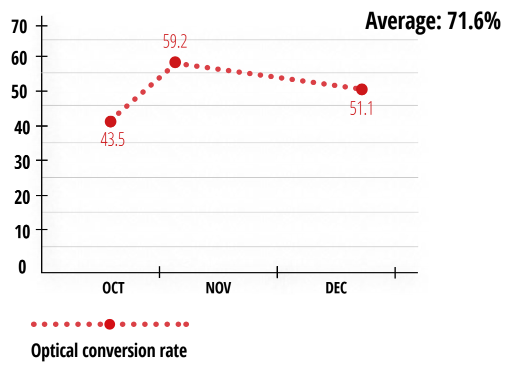


Figure 1b Illustrates the improved outcome after evidence-based quality improvement initiative undertaken in project Chakshjyoti.

the data is presented. The improvements, gaps and interventions are discussed in the meetings and crucial decisions are made to make continuous improvements.

The standard operating procedures of all the departments of the hospital are reviewed each year by the technical experts and updated. Latest national and international guidelines are used for this purpose as evidence.

The quality team of the hospital also takes up various lean six sigma projects for continuous quality improvement. These initiatives are based on the evidence and effectiveness of DMAIC strategy. DMAIC is a data driven quality strategy used to improve processes. It is an integral part of a Six Sigma initiative, but in general can be implemented as a standalone quality improvement procedure. DMAIC is an acronym for five phases that make up the process (Figure 1a)[4]:

- Define the problem, improvement activity, opportunity for improvement, the project goals, and customer (internal and external) requirements.
- Measure process performance.
- Analyse the process to determine root causes of variation, poor performance (defects).
- Improve process performance by addressing and eliminating the root causes.
- Control the improved process and future process performance.

In the year 2016, continuous quality improvement projects were on:

- Project Chakshjyoti: to improve the quality of optical services and optical conversion rate (Fig.1b);
- Project to improve surgical conversion rate;
- Project to reduce patient waiting time in out patient department (OPD)

These projects were taken up and successfully accomplished with evidence-based DMAIC strategy leading to improved quality of services, patient care and sustained the financial health of the hospital.

The hospital also uses EBQI tools like "audit and feedback" to improve its quality of services. A prescription error audit was also done at the hospital in the last financial year taking MCI (Medical Council of India) guidelines as evidence. The results were communicated to the clinicians and post intervention a re-audit was done which showed significant improvement in the system.

Operating theatre starting time is also monitored at all the secondary centres of the hospital. At one of the secondary centres it was showing higher non-compliance consistently. NABH guidelines make it mandatory to have hospital committees to ensure patient safety and prevention from hospital acquired infections. Evidence suggests that these committees are essential and play an important role in patient care.

Hence, such examples illustrate that quality and evidence-based practice are mutually linked. To make quality improvement interventions effective, evidence-based methods are essential. This ultimately leads to improved patient care along with patient satisfaction and sustained financial health of the organisation.

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Test your knowledge and understanding

These questions are designed to help you to test your own understanding of the concepts covered in this issue.

UMESH WARISE, COURTESY OF IAPB

A child is measured for spectacles. INDIA

We hope that you will also discuss the questions with your colleagues and other members of the eye care team, perhaps in a journal club. To complete the activities online – and get instant feedback – please visit **www.cehjournal.org**

Tick ALL that are TRUE

Question 1 When considering the management of myopic children:

- ☐ **a.** It does not matter at what age the intervention is implemented; it has the same effect throughout childhood
- ☐ **b.** Under-correction using spectacles is preferred as the first choice of intervention
- ☐ **c.** There is not much difference between the amount of myopic progression resulting from the use of progressive addition lenses (PALs) and executive bifocal spectacles in children
- ☐ **d.** It is possible that combining orthoK with low-dose atropine to reduce the rate of myopia progression has an additive effect

Question 2 In children at risk of developing myopia:

- ☐ **a.** It is advised that they spend a minimum of 90 minutes of outdoor time daily
- ☐ **b.** It is ideal to compare non-cycloplegic refractions over at least 12 months
- ☐ **c.** Measuring axial length increase is recommended to predict myopia progression
- ☐ **d.** It is a good idea to record data on ethnicity, family history of myopia, time spent outdoors and time spent on near work

Question 3 When detecting myopia

- ☐ **a.** It is important to ask questions about the person's family eye health history
- ☐ **b.** Visual acuity should always be measured for both eyes separately, followed by pinhole acuity
- ☐ **c.** If pinhole acuity improves, this suggests the patient is myopic. It is not necessary to do any further eye health checks
- ☐ **d.** Multiple pinholes are easier for young children to use than single pinholes

Question 4 Considering the myopia epidemic

- ☐ **a.** Myopia is currently associated with an increase in urbanisation, reduced educational pressures and moderate near work
- ☐ **b.** Children are more likely to develop high myopia (≤ –5 D) if they become myopic at a young age (6–8 years old)
- ☐ **c.** One strategy is for all school children to spend time outdoors as this delay or prevent the onset of myopia, and slow down myopia progression
- ☐ **d.** A 25% reduction in incidence among primary school children would mean a significant delay in onset of myopia and perhaps high myopia

ANSWERS

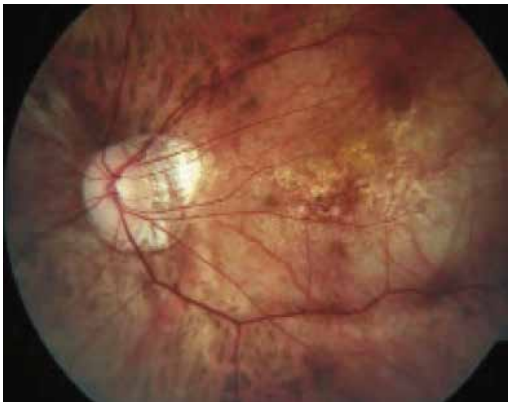
1. a. False. It is essential to implement the intervention during the early years of childhood. b. False. Evidence of the effect of under-correction of myopia is weak and this strategy is not recommended. c. False. PAL spectacles with +2D near addition: 24% control over 3 years. Executive bifocal spectacles with +1.5D near addition: 50% control over 3 years. d. True.

2. a. True. b. False. Cycloplegic refraction is more accurate. c. False. Measuring axial length increase may assist when assessing children prescribed orthokeratology. However, be aware that axial length increases with age, even in children with emmetropia. d. True.

3. a. True. Myopia is heritable, particularly if both parents have myopia. However, it also depends on environmental factors. b. False. Pinhole acuity is only indicated when a patient is not able to see the 6/6 line. c. False. A full eye health check is always required, even if pinhole acuity improves the vision. d. True.

4. a. False. Myopia is currently associated with increased educational pressures and excessive near work, particularly in East Asian populations. b. True. Myopia progresses faster in children who are young (6–8 years old, or even younger). Myopia continues to progress until adolescence, so younger children also have more time during which their myopia can develop. These children are therefore more likely to have high myopia when they enter adulthood. c. False – spending time outdoors does not slow down the progression of myopia in those children that are already myopic. However, if children become myopic only when they are older, their myopia will progress more slowly, as myopia progression is slower in older children (10–12 years old) than in younger children (6–8 years old). d. True.

Picture quiz



DAVID YORSTON

Tick ALL that are TRUE

Question 1

What is wrong with this eye?

- ☐ **a.** Dry age-related macular degeneration
- ☐ **b.** Retinitis pigmentosa
- ☐ **c.** High myopia
- ☐ **d.** Primary open-angle glaucoma

Question 2

Which of the following are more common in patients with this condition?

- ☐ **a.** Retinal detachment
- ☐ **b.** Choroidal neovascularisation
- ☐ **c.** Acute angle-closure glaucoma
- ☐ **d.** Open-angle glaucoma
- ☐ **e.** Ptosis

Question 3

Which of the following have been shown to delay the onset or the progression of this condition?

- ☐ **a.** Not wearing spectacles
- ☐ **b.** Avoiding playing sports
- ☐ **c.** Using low-dose atropine drops
- ☐ **d.** Spend more time outside
- ☐ **e.** Avoiding sunlight

ANSWERS

1. c. It is high myopia. There is tilting of the optic disc with chorio-retinal atrophy around the optic disc and throughout the fundus, associated with a pale retina due to atrophy of the retinal pigment epithelium.
2. a, b and d. Retinal detachment, choroidal neovascularisation and open angle glaucoma are all associated with high myopia.
3. c and d. Spending more time outside has been shown to prevent or delay the onset of myopia and low-dose atropine has been shown to reduce progression of myopia in school-aged children.

British Council for Prevention of Blindness Grant Programme

BCPB British Council for Prevention of Blindness

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CEHJ app

Work is underway to develop an Android and iPhone app for the *Community Eye Health Journal*. The CEHJ app will make it possible to download articles and issues to read – and search – even when you are offline.

If you would like to be notified when the app becomes available, please subscribe to our email newsletter here: www.cehjournal.org/subscribe/

Your data is secure and will not be shared with others.

Erratum

Due to a printing error, the last three bullet points in the article 'Emergency management: acute endophthalmitis' were not printed.

The instructions for preparing ceftazidime 2 mg/0.1 ml for intravitreal injection are as follows:

Ceftazidime 2 mg/0.1 ml

- Reconstitute 500 mg vial with 10 ml saline
- Withdraw all 10 ml into 10 ml syringe
- Inject 2 ml of this solution back into vial
- Add 3 ml saline into vial to make up to 5 ml (20 mg/ml)
- Use 1 ml syringe to draw 0.1 ml of this solution (2 mg/0.1 ml)

The corrected article is available here: www.cehjournal.org/article/emergency-management-acute-endophthalmitis/

Courses

MSc Public Health for Eye Care, London School of Hygiene & Tropical Medicine, London, UK

Fully funded scholarships are available for Commonwealth country nationals. For more information visit www.lshtm.ac.uk/study/masters/mscphec.html or email romulo.fabunan@lsthm.ac.uk

Small Incision Cataract Surgery Training at Lions Medical Training Centre in Nairobi, Kenya

Courses begin every six weeks and cost US $1,000 for training and approximately US $1,000 for accommodation. Email training@lionsloresho.org or call/message +254 728 970 601 or +254 733 619 191.

Myopia calculator and courses

Brien Holden Vision Institute Academy offers a series of online courses (free and paid) and a free online myopia calculator that allows practitioners to model the impact of of various strategies to control the progression of myopia. Visit https://academy.brienholdenvision.org

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Next issue

RACHEL PALMER/SIGHTSAVERS

The next issue of the *Community Eye Health Journal* is on the theme **Medical errors in eye care**

Key community eye health messages

Myopia is an epidemic that needs to be managed

REMO NAGELI/ EYECAREEVERYWHERE

- Uncorrected myopia is the leading cause of avoidable blindness worldwide.
- Myopia (≤ –0.50 D) and high myopia (≤ –5 D) is on the increase. By 2050, half the global population could have myopia.
- This will place a huge burden on already overstretched health budgets, not only to provide spectacle correction, but also to treat the potentially blinding conditions caused by high myopia.

The onset of myopia can be prevented or delayed

GOVERNMENT OF SINGAPORE

- Spending more time outdoors and less time doing close work can prevent or delay the development (onset) of myopia.
- Myopia progresses faster in younger children. Progression slows down during adolescence and ends in early adulthood.
- As a result of faster progression and more time during which progression can take place, younger children are more likely to eventualy develop high myopia.

Myopia can be managed and progression slowed down

SEEMA BANERJEE/ IAPB STRONGER TOGETHER

- Children with myopia need spectacles in order to achieve at school. Early detection and referral is essential, and school eye heath programmes play an important role.
- Slowing down progression reduces the risk of developing high myopia. Interventions incude daily low-dose atropine, bifocals and orthokeratology lenses. Time outdoors does not slow down progression.
- It is important to measure myopia progression in order to check how effective a particular intervention is.