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GUEST EDITORIAL

Seeing beyond 2020: what next for refractive error care?

We are excited to share this Special Issue which is very timely following several recent milestones in eye health globally. First, on World Sight Day in 2019 the World Health Organization (WHO) published the inaugural World Report on Vision.[1] Then, 2020 marked the culmination of the Vision 2020 initiative, launched more than 20 years ago with the aim of eliminating avoidable blindness.[2] Finally, 2021 saw the publication of the first *Lancet Global Health* Commission on Global Eye Health which included evidence that eye health interventions contribute to achieving several of the UN's Sustainable Development Goals (SDGs).[3] Amidst these milestones, the global reach of COVID-19 has affected and hindered eye care delivery. The true impact of this pandemic beyond 2020 has yet to be realised. In this Special Issue we take the opportunity provided by these milestones to look back on progress over the past decades and to look forward to the work still to be done, with a particular focus on refractive error.

Recent decades saw an increased awareness among global eye health stakeholders of the magnitude of refractive error as a cause of vision impairment globally. This is reflected in the revision of the International Classification of Disease (ICD-10) definition of blindness and vision impairment, which historically used best-corrected visual acuity but now uses presenting visual acuity.[4] This change in definition recognised that the assumption that all people with refractive error have access to a correction does not hold true for many throughout the world. Concurrent with this ICD process, epidemiological surveys began to report vision impairment due to uncorrected refractive error, and we now have regular updates on the magnitude globally.

The latest estimates show that in 2020, an estimated 3.7 million people globally were blind (<3/60), and a further 157 million people had moderate or severe vision impairment (worse than 6/18 but better than or equal to 3/60) due to uncorrected refractive error. A further 510 million people had uncorrected presbyopia.[5,6] Most of these people live in South, East and Southeast Asia.[5] Beyond these people with uncorrected refractive error, there are hundreds of millions more whose refractive error is corrected, but they are not routinely measured in prevalence surveys. This will change in the next decade, as surveys begin to routinely collect uncorrected visual acuity in addition to corrected and pinhole visual acuity, allowing met need to be calculated.[7]

While the prevalence of vision impairment due to uncorrected refractive error has reduced over the last 30 years, a growing and aging population has meant that the number of people affected is increasing.[5] Further, these gains have not been shared equally, and in all regions of the world there are people unable to access the refractive care they need. This inequality and the projected population increase means that more of the same will be insufficient, and refractive error care must be advanced and strengthened in a myriad of ways, including strategies to detect refractive error, to prevent and treat myopia, and to deliver high quality, accessible, affordable services that meet the SDG aim to *leave no one behind*.

A large driver of the increase in people with uncorrected refractive error is the current myopia epidemic, impacting on individuals, society and health services.[8-10] Given the large and growing magnitude of the prevalence of myopia[11] and its consequences,[12] myopia is the focus of many of the papers included in this issue. For example, Priscilla and Verkicharla predict a possible future epidemic in India, and call for anti-myopia strategies to become embedded in eye care services.[13] One consequence of having a high level of myopia is the associated risk of developing ocular pathology. Gupta *et al.*[14] investigate the progression of myopia and glaucoma in cases of juvenile onset glaucoma. Strategies to slow the progression of myopia include optical interventions,[15] and the design of these interventions has the potential to influence a person's balance and walking. Przekoracka *et al.*[16] assessed the impact of multifocal contact lenses on postural control on a cohort of young adults. They suggest that a high add may have detrimental effects on postural control. Whether this also occurs in children is unknown. From a study in Germany, Rauscher *et al.*[17] report ocular biometry among 1,907 children and propose these parameters be used as a basis to assess eye growth and refractive error development in European children. Monitoring eye growth requires accurate, precise and repeatable technology. In a complementary study, Rauscher *et al.*[18] contend that the Lenstar LS 900 is a feasible and reliable tool to monitor these biometry measurements. Chamberlain *et al.* report on axial elongation over 3 years among treated and untreated progressing myopes alongside emmetropic children, and conclude that axial elongation in optically-based myopia control treatments tracks that of normal eye growth in emmetropes. Insight into normal eye growth in children is a requisite to understanding expected axial eye growth in children with myopia and those in myopia-management intervention strategies.[19] Truckenbrod *et al.*[20] have generated growth curves for children 3 to 18 years of age in Germany. They suggest that these growth curves can be used as a predictive measure for assessing the risk of myopia development and progression. Ultimately, to predict and monitor eye growth better there is a need for population specific axial length growth curves along with accessible and affordable biometry instrumentation for eye care practitioners.

To maximise visual outcomes for children with refractive error, it is imperative to intervene early, and several papers in this issue explored screening and assessment of children. From a study in Aotearoa / New Zealand, Findlay *et al.*[21] call for the Spot vision screener to be added to the current Parr vision test in the national programme to improve the sensitivity and specificity of amblyopia detection in 4-5 year olds. From the USA, Ciner *et al.*[22] found that amongst 4-5 year old children without strabismus or amblyopia, visual acuity, accommodative lag and stereoacuity all reduced with increasing hyperopia; based on these findings, the authors call for near visual function to be routinely assessed in children with hyperopia. In India, Seelam *et al.*[23] report results from a realist evaluation of a school-based eye health programme with a target population of 2 million children. Their effort to unpack the complexity of their large programme to understand *how* and *why* they achieved their outcomes (or didn't), and the importance of context, is novel in eye health. To maximise benefit from School Eye Health programmes and create generalisable knowledge, we encourage researchers to more often assess and report what works, for which children and in what circumstances.

The epidemiological estimates outlined above are important to understand the scale of the problem, and to inform policies and plans globally, regionally and nationally. However, clinicians do not need these numbers to appreciate the impact of refractive error on patients encountered every day. Wood *et al.*[24] highlight the impact of even small amounts of blur on the ability of drivers to judge the walking direction of pedestrians at night. Patient-reported outcomes such as quality of life can be used to measure the impact of refractive error care, and their use alongside visual acuity takes us towards more patient-centred care, as was called for by the WHO in the World Report on Vision.[1] In this issue, Kandel *et al.*[25] have strengthened our ability to evaluate quality of life parameters following refractive error management, by identifying refractive error-specific item banks.

A well-trained workforce is essential to meet the growing need for refractive error care. Unfortunately, there is a massive maldistribution of optometrists globally, with 221 per million population in high-income countries, but only 1 per million population in low-income countries.[3] The Covid-19 pandemic has created immense disruption to training programmes, and in this issue Naroo *et al.*[26] explore this in relation to contact lens education, highlighting the shift towards online teaching that is taking place globally. A positive clinical teaching outcome is the online model allowing greater accessibility of high-quality collaborative teaching across the world.

A key strategy to reduce the prevalence of uncorrected refractive error is to ensure that a good quality correction is accessible and affordable for all who require it. The extent to which this is achieved is measured by the *effective refractive error coverage* indicator (eREC),[7] endorsed by WHO as one of two key indicators to monitor global eye health.[1] The recent *Lancet Global Health* Commission highlighted a dearth of information on the eREC, as well as evidence on strategies to improve access to refractive error care.[3] In a systematic review and meta-analysis, Bist *et al.*[27] contribute to closing this evidence gap, reporting that the proportion of people discontinuing spectacle wear shortly after dispensing ranged between 1.6% and 3.0%, mostly due to a refraction error or miscommunication. While this proportion is relatively low, the authors highlight the limited contexts in which the five included studies were conducted—refractive error care may be of lower quality in other contexts. We call for much more research into how refractive error services can improve access to good quality, accessible and affordable correction.

This research should extend to the role of the private sector in meeting the massive need for refractive error care globally.[28] This year marks the 50th anniversary of the inverse care law (*below*). We challenge private sector actors, including national and multinational commercial entities, and their advocates to create partnerships with governments and establish other mechanisms to ensure refractive error care is designed and delivered so that no one is left behind.

> The availability of good medical care tends to vary inversely with the need for it in the population served. This inverse care law operates more completely where medical care is most exposed to market forces, and less so where such exposure is reduced.

One strategy which would help the eye health sector commit to an equity-focused agenda is to have diverse leadership structures.[29] Yashadhana *et al.* highlight that we have a long way to go to have leaders that reflect the gender- and ethnic-diversity of the profession or the population. Currently only 1 in 3 board members of member organisations of the International Council of Ophthalmology and the World Council of Optometry are women, falling to 1 in 17 being a woman from an ethnic minority.[30]

Refractive error represents a large and growing problem, with pervasive inequity nationally and globally. We must develop and strengthen technology and treatments to ensure that all aspects of refractive error care are high quality, accessible, affordable and timely for all. The COVID-19 pandemic has slowed our progress towards universal eye health. We must learn from the pandemic response to chart a collaborative global response to advance refractive error care and leave no one behind.

Author Contributions

J.R. and N.S.L. worked collaboratively to draft this editorial.

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