THE SIZE OF THE MYOPIA PROBLEM

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It shouldn't be unfamiliar to any eyecare professional by now to hear about the worldwide increase in the frequency of myopia, the threat that this poses to the lifelong eye health of our population, and the imperative role that eyecare practitioners must play in the education about and the detection and management of childhood myopia. But you may be wondering: How big is the myopia problem?

The Big Picture

The oft-cited projections of Holden et al (2016) indicate that 23% of the world's population are currently myopic and 3% have high myopia. If current trends continue, this will skyrocket to half of the world being myopic by 2050 and 10% having high myopia, which brings with it significant risks of ocular pathology and vision impairment (Holden et al, 2016).

The myopia problem is a global one, although it is not uniform in size. In China, the prevalence of overall myopia in 15-year-olds increased from 80% in 2001 to 88% in 2015, with high myopia (more than 6.00D) doubling from 8% to 17% (Chen et al, 2018). A systematic review of childhood myopia prevalence across the world indicated that from 2010 to 2015, prevalence had increased by 23% in East Asians, with weaker increases across other ethnicities (Rudnicka et al, 2016). By age 15, around 69% of East Asian children are myopic—with the highest ethnic prevalence reaching 86% in Singaporean-Chinese—while the lowest prevalence of myopia is only 6% in black children in Africa.

Living in an urban environment almost triples the odds of myopia, resulting in ethnic differences in myopia by geography. For example, South Asian (e.g., Indian, Pakistani, Bangladeshi, and Nepalese) children living in Australia, England, or Singapore have around five times greater odds of being myopic compared to their counterparts living in India or Nepal. Gender analysis indicates that late-teenage girls are twice as likely as boys to be myopic in white and East Asian populations (Rudnicka et al, 2016). The global share of childhood myopia is highest in Asia, accounting for nearly 80% of cases, but western countries still have an important role in leading global clinical best practices, product development, and research contribution.

Brought back to the level of individual eyecare practitioners (ECPs), the size of the myopia problem comes down to three factors. First, in view of taking action to manage myopia, ECPs must understand the size of one diopter of myopia and what it means for lifelong eye health risk to control diopters of myopia.

Second, the physical size of the eyeball—axial length—seems to be the key measure that myopia control needs to target to modify disease risk, but most clinicians do not yet measure this routinely. I will discuss the nuance of understanding axial length in clinical practice.

Finally, there is the size of the logistics of what steps to take to implement myopia management for the next young myope in the chair.

Each of these "size" factors is crucial to change current practice patterns in which more than 50% of young progressing myopes are currently being prescribed single-vision corrections, which are not evidence-based choices to control myopia progression (Wolffsohn et al, 2019).

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The Size of One Diopter

The size of one diopter is an important concept. Several years ago, a colleague asked, "What's the difference between being –2.00D and –3.00D anyway?" This is an important question that has only recently been answered.

The traditional notion of "physiological" versus "pathological" myopia, delineated at around 5.00D to 6.00D, has already been

debunked by Flitcroft's landmark analysis (2012) showing that even lower levels of myopia increase the odds of posterior subcapsular cataract, maculopathy, and retinal detachment compared with emmetropia. These data indicate that to call any level of myopia "physiological" is a misnomer, as this implies no additional risk of pathology.

Taking this one step further, Bullimore and Brennan (2019) analyzed five recent population-based studies accounting for more than 21,000 patients, most of whom were older than 50 years, and concluded that each additional diopter of myopia increases the lifelong risk of incident myopic maculopathy by 67%. This relationship held regardless of the initial level of myopia and regardless of participant characteristics of the five studies included in the analysis.

Restated in view of preventative eye care, reducing a patient's final level of myopia by 1.00D reduces the lifelong risk of myopic maculopathy by 40%, regardless of the final level of myopia. By comparison, the Age-Related Eye Disease Study (AREDS) demonstrated that daily oral antioxidants plus zinc resulted in a 25% reduction in progression of age-related macular degeneration (Bullimore et al, 2019). When focusing on primary and preventative eye care, these new data provide a clear case for the "why" of myopia control and just what one single diopter can mean to an individual patient over the course of his or her lifetime.

The Size of the Eye

Secondly, the size of the myopic eye is key to understanding the risk of myopia pathology and also of vision impairment. An analysis of almost 10,000 Dutch people who had an average age of 60 showed that an axial length of 26mm increased the likelihood of vision impairment by age 75 to at least 25%, as opposed to 4% for eyes that had axial lengths shorter than 26mm. Once an eyeball stretches to greater than 30mm long, these data showed that there was a 90% incidence of vision impairment in old age (Tideman et al, 2016).

As a single measure of disease risk in adult patients, axial length is very useful to understand the required frequency of clinical investigations for retinal pathology, such as fundus examination through dilated pupils and optical coherence tomography of the macula; for instance, an axial length greater than 26mm likely necessitates more frequent monitoring. In this way, axial length can be thought of as similar to a single measurement of central corneal thickness in adults, which helps to correctly calculate intraocular pressure and provide some indication of glaucoma risk.

In children, it is likely that axial length measurement will eventually become a clinical gold standard to assess for myopia progression and the success of a myopia management strategy. Axial length measurement is already the gold standard in assessing research outcomes (Wolffsohn et al, 2019); however, there is still a lot to learn about normal axial growth during childhood emmetropization and the typical growth patterns during myopia progression before axial length measurement becomes a standard requirement of pediatric myopia management.

This is recognized in the International Myopia Institute (IMI) Clinical Management Guidelines, which currently recommend axial length measurement every six months when available (Gifford et al, 2019).

Many ECPs who were early adopters of myopia management already measure axial length and, similarly for adults, use the benchmark of 26mm and the child's age to help gauge the level of concern in broaching this boundary for risk.

The Size of the Logistics

Finally, the "size" of the logistical problem with myopia management involves ECPs considering how to put this wealth of research knowledge and increasing availability of spectacle, contact lens, and pharmacological treatments into practice. Numerous resources are available to assist with this.

Consideration of the time required to undertake baseline examination and follow up, as recommended by the IMI Clinical Management Guidelines (Gifford et al, 2019), is the first step. The suite of IMI reports can help ECPs understand the evidence base on interventions (Wildsoet et al, 2019), ethical considerations (Jones et al, 2019), and key aspects of parent/caregiver communication (Gifford et al, 2019). Online web resources, courses, peer discussion groups, and the groundswell of professional publications, such as this special issue, provide practical commentary on this growing area of clinical practice.

Don't Let It Get Any Bigger

The information is available, and the line in the sand is clear: The time is now to manage myopia for the lifelong benefit of our individual pediatric patients and for the eye health of the population. **CLS**

For references, please visit www.clspectrum.com/references and click on document #SE2019.

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