Editorial

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The impact of the pandemic highlights the urgent need for myopia guidelines: The clinicians' role

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Abstract

Myopia is already one of the leading causes of permanent vision impairment, including blindness, and the COVID-19 pandemic has exacerbated the global myopia-related burden among children owing to home confinement, increased screen time (e-learning), and decreased outside activities. To reverse the rising trend of myopia and myopia-related blindness, collaborative efforts are required. There is a wealth of evidence-based medicine (EBM) data on the epidemiology of myopia and effective interventions, but very little has been published on the clinicians' roles and responsibilities. However, this aspect is critical because preventing the onset and progression of myopia necessitates extensive health promotion and advocacy efforts among decision-makers. Only broad medical expert collaboration can bring about the necessary changes in children's lifestyle and education. This article discusses clinicians' critical roles in preventing the onset and progression of myopia.

Keywords

Myopia, pathologic myopia, COVID-19 pandemic, blindness, preventive medicine, screening, public eye health, advocacy, health promotion

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Even before the COVID-19 pandemic, the number of people with myopia in 2020 was estimated to be 2.6 billion globally, and it was expected to rise up to 4.9 billion by 2050, unless preventive actions and interventions were taken.[1] Myopia is an important health-care problem due to its well-known complications and the natural course of high myopia; myopia is already one of the most common causes for irreversible vision impairment including blindness.[1,2] Without setting guidelines and the prompt establishment of national reforms, the existing large number of myopes is bound to rise considerably.

The children population is the most crucial one, as myopia is increasing the greatest among the young generation. Recent studies found that a) in Hungary, the prevalence of myopia was three times higher (57%-61%) in younger age groups (18–35y) than in older ones[3]; b) in France, the highest prevalence of myopia was also found in the age groups between 10–39y, with a similarly high peak (52.4%) in those aged 20–29y[4]; and c) the European Eye Epidemiology Consortium found the highest rates of myopia (around 40%) in younger age groups.[5]

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Preventing myopia and its progression became all the more important, since home confinement during the COVID-19 pandemic has exacerbated the worldwide burden of myopia.[6] Studies exhibited an 1.4 to 3.6 times increase in myopia progression during the COVID-19 lockdown,[7–10] especially in younger children,[6,10,11] even in children under low-dose (0.05% or 0.025%) atropine therapy.[11] Studies showed that the statistically most important risk factors for an increased myopia progression were the increased digital device screen time of children (in association with a significant increase in e-learning using smartphones, tablets or computers) and the decreased time spent on outdoor activities (and reduced sunlight exposure) due to home confinement.[6,7,9–14] The digital screen time of children increased 1.3 to 7.8 times during the COVID-19 lockdown as compared to the pre-COVID time[7,11–14] while the outdoor activities decreased by 48.6% to 62.8%.[7,8,11,14]

The COVID-19 epidemic presented an unwelcome chance to test the impact of behavioral changes and myopia in the real world.[13] Based on these new findings, it is critical to address the environmental risk factors for myopia, even in children undergoing therapy to slow down myopic progression.[11] As children's physical activity during the first COVID-19 UK lockdown was significantly reduced,[15] promoting safe physical outdoors exercises for all children is critical not only for myopia control but also for the children's overall health and development.[12,15,16]

There is a wealth of evidence-based knowledge on myopia, including its onset, progression, risk factors, screening and detection, follow-up, and interventions for myopia control.[2,17] The significant increase in the number of articles published about myopia in general is not matched with information and discussion about the roles and responsibilities of specialists in the prevention of myopia and reduction of its progression. This article provides an overview of the required action.

1. Primary prevention refers to procedures used *to prevent the onset of a disease, in this instance myopia*. The highest level of evidence supports the need for children to spend more time outdoors and do less near vison activities (level I. evidences, Elsevier) to prevent or at least delay the onset of myopia.[6–14,18,19] Strong evidence (level III. evidences, Elsevier) has shown the major preventive nature of increased reading distance (more than 20–30 cm),[20] limitation of continuous reading (less than 30–45 min),[21] and use of incandescent or fluorescent light bulbs (instead of LED lamps).[22] Using natural light or extremely bright light bulbs (over 3000 Lux) indoors is beneficial for myopia prevention.[20] Children who used television and projectors for online or e-learning had significantly less myopic shift than those who used tablets and mobile phones, suggesting that television and projectors may be superior options for online learning.[14]

Preventing the onset of myopia requires health promotion. Medical experts have a dual role. There is a need to present current information and necessary interventions in a manner that would encourage decision makers and politicians to undertake actions and decisions that accomplish environmental changes. To modify the environmental factors surrounding education necessitates action from the Ministries of Education, including the provision of evidence-based facts about myopia to children and parents as well as to those in charge of initiating and achieving lifestyle changes among children. Eye care specialists should play a key role in information dissemination and advocacy since they are more familiar with the epidemiological and scientific facts about the myopia epidemics and feasible preventative methods.

Further concrete actions of clinicians might be:

- Regular teaching of nurses and social services
- Education of nursery school staff about the importance of light and safe outdoor activities (socially distant during the pandemic)
- Education of school teachers and healthcare officers about proper reading distance, light intensity, and the importance of recess and outdoor activities
- Regular teaching of optometrists who deal with pediatric groups
- Regular teaching of students, showing them spectacles and how they will see if they develop myopia
- Provision of leaflets using simple layman terms can be made available at schools and GP practices
- Discussions and workshops about the national and regional possibilities of myopia prevention in the national and regional ophthalmological societies
- Development of a national plan for myopia prevention
- Organization of national, regional and local media campaigns on myopia prevention. "Save our children's sight" might be a campaign slogan.
- Undertaking actions to increase the awareness of the problem among local, regional and national health authorities

2. Secondary preventive strategies involve detecting and addressing an existing disease before symptoms arise. Secondary prevention in the case of myopia aims to keep pre-myopes from advancing to myopia. Pre-myopia describes a state of refractive error, ranging from $\leq +0.75$ D to >-0.50 D, in children when a combination of baseline refractive error, age, and other quantifiable risk factors provides a sufficient likelihood of future development of myopia (International Myopia Institute definition,[23] adopted by the European Ophthalmological Society[2]). *Screening and monitoring pre-myopes to avoid progression* to myopia are secondary preventative methods. Scientific data suggests that pre-myopes can be

identified at preschool age by active population screening, which includes cycloplegic refractometry, evaluation of binocular vision (level I. evidence, Elsevier) and ocular axial length measurements.[2,17,24] Following the identification of pre-myopes, monitoring is required, which involves both monitoring of axial eye length growth and monitoring of changes in refractive error measured under cycloplegic conditions. Intervention is recommended in cases of abnormal binocularity or progression of ocular axial elongation.

Secondary prevention needs active screening and follow-up programs. The task of eye care personnel is to submit evidence on unmet needs and appropriate ways of such screening campaigns to decision makers/politicians so that the Ministries of Health and Education can develop mass screening programs for preschool children. There is also a need to raise public awareness by disseminating information through various media (news, radio, television, online, etc). Eye care and medical professionals need to prepare appropriate messages for the public and to be prepared to undertake screening, follow-up, and interventions for pre-myopes.

Further concrete actions of a clinician might be:

- Regular teaching of nurses and social services who perform the vision screening
- Pediatric ophthalmologist or optometrist checking the binocular vision of preschool children and young schoolchildren regularly
- Clinicians should educate those who examine children about the importance of axial length and its measurement
- Creation of screening protocols
- Advocacy in local, regional, and national health care and education authorities to develop and perform screening programs for screening and monitoring pre-myops

3. Tertiary prevention is the management of a condition after it has been diagnosed in order to delay or stop its progression. Tertiary prevention strategies are *myopia controlling methods that slow the progression of myopia*. Also based on the landmark "Atropine for the Treatment of Myopia 2" study by Chia and colleagues,[25] the primary evidence-based therapies are as follows (Level of evidence by Cochrane 2020 in brackets, M: Moderate, L: Low)[26]: low-concentration atropine eye drops (M), multifocal spectacle design (M), contact lenses with power profiles that generate a peripheral myopic defocus (L), and orthokeratology, which employs corneal gas-permeable contact lenses to flatten the central cornea, resulting in midperipheral steepening and peripheral myopic defocus, during overnight wear to eliminate daytime myopia (M). Concerning the low-dose atropine, studies showed that the 0.05% atropine concentration to be the most effective one,[27] especially in young children.[28] Some of these measures can be combined and may be useful.[2,17,26]

Tertiary prevention to avoid progression to high myopia necessitates active work by eye care professionals. There is an urgent need to advocate the appropriate assessment procedures as well as potential myopia control interventions. Campaigning for proper funding of necessary myopia examinations, follow-up examinations, interventions, optical equipment, and eye drops in the healthcare budget is required by all stakeholders.

Concrete actions of clinicians might be:

- Organizing training courses for eye care specialist on the application of myopia control methods suggested by the latest literature
- Providing flowcharts to assist in selecting the best myopia control method for a child
- Definition of the timing of control examinations in a protocol
- Selection of the most appropriate intervention individualized for the children
- Advocacy for proper funding of anti-myopia examinations, therapies and equipments

There are examples of such successful projects and programs of implementation of myopia guidelines (Annex, supplemental material).[17,29,30] Because the myopia epidemic began in East Asia, there are lessons to be learnt from the colleagues in that world region. There are currently active governmental programs to combat the increase in myopia which can be implemented in other regions of the world, including Europe, where myopia is already on the rise.

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Supplemental material

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