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Editorial

The Growing Concern of Myopia in Children: Causes and Innovative Treatments

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Abstract

The global prevalence of myopia, especially among children, is rising at an alarming rate. This article examines the factors contributing to this trend, such as genetic and environmental influences, and highlights innovative treatments including orthokeratology and low-dose atropine. With an emphasis on data and evidence from recent studies, the article aims to provide a comprehensive overview of the current state of pediatric myopia and emerging solutions. The role of myopia management in preventing long-term ocular complications is also discussed.

Keywords: *Myopia; Children; Orthokeratology; Atropine*

Introduction

Myopia, or nearsightedness, is becoming a significant public health issue worldwide. By 2050, it is estimated that nearly half of the global population (5 billion) will be affected by myopia, with up to 10% suffering from high myopia [1]. The rising prevalence of myopia, particularly in children, poses risks such as retinal detachment, glaucoma, and myopic maculopathy. This article explores the causes behind this trend and reviews innovative treatments that are being developed to manage and slow the progression of myopia in children.

Epidemiology and prevalence

The prevalence of myopia varies across regions but has shown a marked increase globally. In East Asia, countries like China, Taiwan, South Korea and Singapore report myopia prevalence rates exceeding 80% among high school students [2]. In contrast, studies in India indicate a prevalence ranging from 5% to 25% among children aged 5 to 15 years [3]. This stark contrast highlights the role of both genetic and environmental factors in myopia development.

Causes of myopia

Myopia is primarily influenced by genetic predisposition and environmental factors.

Genetic factors

The genetic component of myopia has been well-documented. Children with one myopic parent have a two to three times higher risk of developing myopia, while those with two myopic parents have a five to six times higher risk [4]. Genome-wide association studies (GWAS) have identified several loci associated with myopia, providing insights into its hereditary nature [5].

Environmental factors

Environmental influences, particularly lifestyle changes, have significantly contributed to the myopia epidemic. Factors such as reduced outdoor activity in sun light, increased near work, and prolonged screen time are critical.

Outdoor activities

Outdoor activities have been shown to have a protective effect against myopia development. Studies indicate that spending more time outdoors in sunlight can reduce the risk of developing myopia by approximately 2% for every additional hour spent outside per week [6]. The hypothesized mechanism involves exposure to natural light, which may help regulate eye growth.

Near work and screen time

Increased near work activities, such as reading, writing, and using digital devices, have been linked to a higher risk of myopia. A meta-analysis found that children who engaged in prolonged near work were at a significantly increased risk of developing myopia [7]. Additionally, excessive screen time has become a major concern, with children spending more than two hours daily on screens being twice as likely to develop myopia compared to those with limited screen time [8].

Innovative treatments for myopia

The management of myopia has evolved with the development of innovative treatments aimed at slowing its progression.

Orthokeratology

Orthokeratology (Ortho-K) involves the use of specially designed rigid gas-permeable contact lenses that are worn overnight. These lenses temporarily reshape the cornea, providing clear vision during the day without the need for glasses or contact lenses. Ortho-K has been shown to significantly slow the progression of myopia by reducing axial elongation. A meta-analysis reported that Ortho-K lenses reduced axial elongation by approximately 43% compared to control groups [9].

Low-dose atropine

Atropine eye drops, particularly at low concentrations (0.01%), have emerged as a promising treatment for myopia control. The Atropine for the Treatment of Myopia (ATOM) studies conducted in Singapore demonstrated that low-dose atropine effectively slowed myopia progression by about 50% over two years, with minimal side effects [10]. The proposed mechanism involves relaxation of the ciliary muscles, reducing eye strain and slowing eye growth.

Combination therapies

Recent studies have explored the use of combination therapies, such as combining Ortho-K lenses with low-dose atropine, to enhance the efficacy of myopia control. Preliminary findings suggest that combination therapies may provide additive benefits in slowing myopia progression [11].

Impact of myopia management

Effective myopia management is crucial in preventing long-term ocular complications. High myopia is associated with an increased risk of sight-threatening conditions such as retinal detachment, myopic maculopathy, and glaucoma. By slowing the progression of myopia, these risks can be mitigated, improving long-term visual outcomes.

Global initiatives and public health strategies

Recognizing the growing myopia epidemic, several countries have implemented public health initiatives aimed at reducing its prevalence. Programs promoting outdoor activities in schools, reducing screen time, and early vision screening are essential components of these strategies. For instance, the "Myopia Control in Children" program in Taiwan has shown promising results in reducing myopia prevalence through a combination of education and environmental modifications [12].

Future directions

Research into the genetic and environmental factors contributing to myopia is ongoing, with the aim of developing targeted interventions. Advances in wearable technology, such as devices that monitor visual habits and provide feedback, may offer new avenues for myopia prevention and management. Additionally, the development of new pharmacological agents and improved contact lens designs holds promise for more effective myopia control in the future.

Conclusion

The rising prevalence of myopia in children is a significant public health concern. Understanding the genetic and environmental factors contributing to myopia, along with the development of innovative treatments like orthokeratology and low-dose atropine, is crucial in addressing this epidemic. Continued research, public health initiatives, and collaboration among ophthalmologists, educators, and policymakers are essential to combat the myopia crisis effectively. By implementing comprehensive myopia management strategies, we can reduce the burden of myopia and improve visual outcomes for future generations.

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