High Myopia: Reviews of myopia control strategies and myopia complications

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Background

Myopia is defined as a condition in which the spherical equivalent refractive error (SER) of an eye is ≤-0.50D and high myopia where the spherical equivalent is ≤-5.00D[1] or ≤-6.00D[2] when ocular accommodation is relaxed. [2]

Myopia and especially high myopia are recognised as major public health concerns because of the significant increase in the risk of vision impairment from associated pathological complications, especially in high myopia.

Prevalence of high myopia in young children is low, but 10-20% of high school children in Asia have high myopia with many still progressing.[3;4]

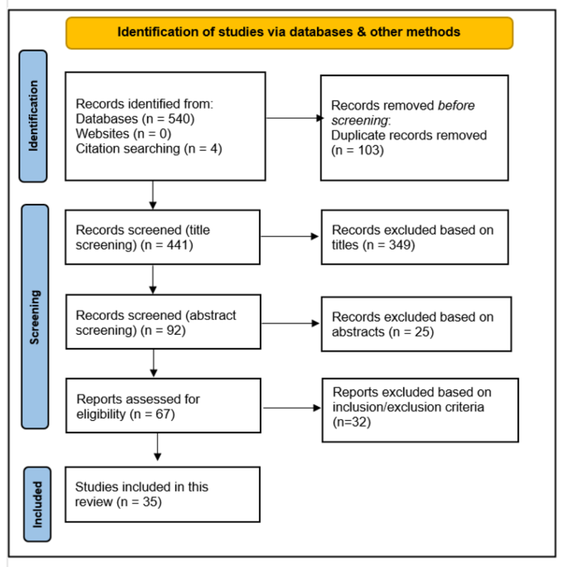
Most participants in myopia control studies have low and moderate myopia; relatively little is known about myopia control in high myopia.

Method

PubMed and Embase searches to identify publications investigating:

- ***AIM 1:*** *The efficacy of myopia control strategies (environmental, pharmacological and optical) in highly myopic patients*
- ***AIM 2:*** *The structural and pathological complications of high myopia*

Outcomes included change in spherical equivalent refractive error (SE) and/or axial length (AL) to evaluate progression of high myopia.



Results

- Twelve studies were identified that reported the efficacy of optical and pharmacological (none on environmental) interventions on AL and SE for high myopia control.
- All four studies using higher dose atropine (0.5 & 1%) found a substantial treatment effect at slowing myopia progression in highly myopic patients. However, there was a higher incidence of side effects and rebound effect on discontinuing therapy.[5]
- Lower doses of atropine are less effective. Compared with no treatment, 0.01% atropine showed an effect at slowing myopia progression in highly myopic children. Lower doses had reduced side effects and reduced likelihood of a rebound effect.[5]
- Ortho-K lenses were equally effective in reducing myopia progression in low, moderate and high myopia.
- Spectacle optical interventions had a lower efficacy in slowing myopia progression in highly myopic patients compared to moderate and low myopia.
- AIM 2: Myopic patients have an increased risk of myopic macular degeneration, retinal detachment, cataract and glaucoma, with the risk increasing with level of myopia.[6]

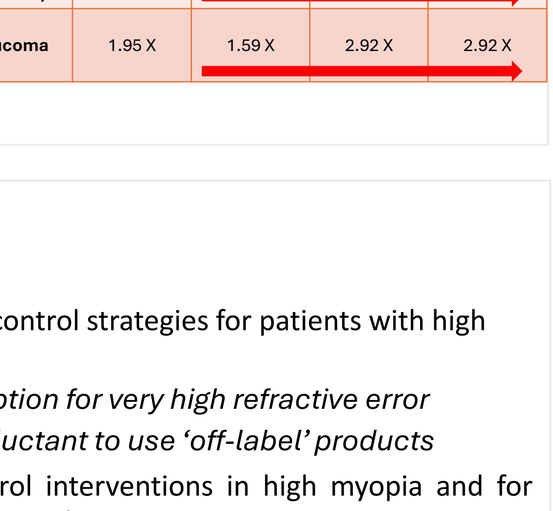
	ANY MYOPIA	LOW MYOPIA (up to -2.75D)	MODERATE MYOPIA (-3.00D to -5.75D)	HIGH MYOPIA (> -6D)
Myopic Macular Degeneration	102.11X	13.57 X	72.74 X	845.08 X
Retinal Detachment	3.45 X	3.15 X	8.74 X	12.62 X
Cataract (Posterior Subcapsular)	2.09 X	1.56 X	2.55 X	4.55 X
Cataract (Nuclear Sclerotic)	2.51 X	1.79 X	2.39 X	2.86 X
Glaucoma	1.95 X	1.59 X	2.92 X	2.92 X

Discussion

- It is imperative for Eye Care Professionals to identify the key risk factors for high myopia (age and level of baseline myopia) to determine prognosis and necessity for myopia control.
- Five clinical effectiveness studies investigated the role of atropine in high myopia and progressive myopia with a statistically significant reduction in progression of myopia refractive error in high myopia with higher dose atropine (>0.5%).
- Four studies investigated the role of Ortho-K in high myopia. Although Ortho-K lenses are effective in slowing axial elongation for all levels of myopia, higher rates of corneal staining for higher levels of myopia could limit their use in these cases.
  - *Important to consider safety when fitting Ortho-K lenses in young children*
- There are very few available myopia control strategies for patients with high myopia.
  - *One 'on-label' soft contact lens option for very high refractive error*
  - *Eye Care Professionals may be reluctant to use 'off-label' products*
- The need for effective myopia control interventions in high myopia and for children whose early onset myopia and/or rapid progression that could be predictive of subsequent high myopia leads to consideration of different combination strategies for future work:
  - *Environmental + Pharmacological*
  - *Environmental + Optical (spectacle/contact lenses)*
  - *Pharmacological + Optical (spectacles/contact lenses)*
  - *Environmental + Pharmacological + Optical (spectacle/contact lenses)*

Conclusions

- High myopia has significant financial costs, impact on quality of life, risk of pathological complications and a risk of irreversible visual impairment. [6]
- Young children, excluding those with syndromic associations, who are fast progressing moderate and high myopes require early intervention and close monitoring.
- In young children with early myopia onset, the aim should be to prevent high myopia through early intervention and treatment, monitoring myopia progression, increasing treatment dose and/or considering combination treatment.[6]
- Further research investigating the efficacy of myopia control strategies in highly myopic patients, both independently and through combination treatments are necessary. [6]



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Conflicts of Interest

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