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High myopia and its risks

High myopia increases the risk of blinding eye conditions, so regular follow-up is essential.

High myopia is said to occur when a person's myopia progresses until they need -5 dioptres (D) or more of spherical correction,^{1,2} although the definitions used to grade myopia are variable.

The prevalence of myopia is increasing globally.³ It has been predicted that, by the year 2050, high myopia will affect 9.8% of the global population; a total of 938 million people.⁴ The highest prevalence of myopia is seen in younger adults, particularly in urbanised East and Southeast Asian countries.²

Even when appropriate refractive correction is provided, myopia continues to place an individual at an increased risk of sight-threatening diseases, including^{5,6}:

- Glaucoma (open-angle)
- Cataract (nuclear, cortical and posterior subcapsular)
- Retinal tears which may lead to a retinal detachment
- Myopic maculopathy or myopic macular degeneration

The incidence of these conditions is greatest in individuals with high myopia.

Glaucoma. A systematic review of the available evidence concluded that the risk of developing glaucoma was nearly 50% higher (or one and a half times as high) in individuals with moderate to high myopia, compared to those with low myopia (odds ratios [OR] of 2.5 and 1.7 respectively).⁷

Cataract. Higher rates of cataract surgery are seen in individuals with high myopia. Based on the available evidence, they are 17% more likely than those with moderate myopia to need cataract surgery (odds ratios of 3.4 and 2.9, respectively).⁸

Retinal detachment. The risk of developing a retinal detachment is five or six times greater in people with high myopia (OR >20) compared to those with low myopia (OR <4).⁹ People with high myopia have longer eyes (axial elongation), which means that the retina is more stretched and therefore prone to peripheral retinal tears. In addition, myopic eyes have a degenerate vitreous that is more likely to collapse and separate from the retina, also increasing the risk of retinal tears. High myopia can also cause central retinal degenerative changes such as posterior staphyloma, lacquer cracks and chorioretinal atrophy; these have been used to grade myopic maculopathy.¹⁰

Myopic macular degeneration (maculopathy). The risk of macular degeneration due to myopia rises sharply with age and increasing myopia.⁹ Myopic maculopathy may take the form of atrophic changes or be complicated by choroidal neovascular membrane



High myopia increases the risk of potentially blinding eye conditions. UK

(CNV) formation.¹⁰ Advanced myopic maculopathy causes loss of central vision and there is currently no treatment for the atrophic form. With the increasing prevalence of myopia, visual impairment caused by this condition will continue to rise.

Speaking to patients with myopia

It is important to make patients aware of these potentially sight-threatening conditions and that their risk appears to be proportionate their degree of myopia. Any sight loss should therefore prompt patients to seek a complete ophthalmic assessment.

Retinal detachment can affect any age group. Tell patients to contact an eye specialist immediately if they see flashing lights (usually seen in dim light in the temporal peripheral field) or floaters, or if they experience visual field loss. They must undergo an urgent dilated exam to exclude retinal tears and/or detachment.

Central visual loss as a result of advanced myopic macular degeneration can affect people of working age, so examine the macula at every visit. Individuals who develop CNV may be treated with intravitreal anti-VEGF therapies.¹¹ Refer those with central visual loss for low vision assessment and/or offer hand-held magnifiers.

Because the risk of open-angle glaucoma increases in individuals with high myopia, it is wise to assess intraocular pressure and optic disc appearance at every visit. Assess visual fields if possible.

Ophthalmic workers should acknowledge high myopia as a significant cause of visual impairment and a risk factor for a number of sight-threatening conditions.

Key messages

- High myopia is becoming more common
- Even if the refractive error is corrected, the eye is at risk of visual impairment, particularly if the myopia is ≤ -5 D
- Myopia increases the risk of open-angle glaucoma, retinal detachment, and myopic macular degeneration

High myopia

The definition of high myopia as ≤ -5 D was adopted as the World Health Organization (WHO) definition in 2015. A person who needs ≤ -5 D of correction has a visual acuity that is far worse than the threshold for blindness ($-3/6$ in the better eye).

Odds ratios (OR) are used to express relative risk in case-control studies such as those referred to in this article. In these studies, participants are grouped according to the outcome, e.g., whether they had cataract surgery or not, and then information is obtained about their exposure to a risk factor. In these studies, the risk factor is high myopia.

References

- 1 The Eye Diseases Prevalence Research Group. The Prevalence of Refractive Errors Among Adults in the United States, Western Europe, and Australia. *Archives of Ophthalmology*. 2004;122:495-505.
- 2 Pan CW, Ramamurthy D, Saw SM. Worldwide prevalence and risk factors for myopia. *Ophthalmic Physiology and Optics*. 2012;32(1):3-16.
- 3 Dolgin E. The myopia boom. *Nature*. 2015;519(7543):276-8.
- 4 Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology*. 2016;123(5):1036-42.
- 5 Saw SM, Gazzard G, Shih-Yen EC, Chua WH. Myopia and associated pathological complications. *Ophthalmic Physiology and Optics*. 2005;25(5):381-91.
- 6 Mitchell P, Hourihan F, Sandbach J, Wang JJ. The relationship between glaucoma and myopia: the Blue Mountains Eye Study. *Ophthalmology* 1999;106(10):2010-5.
- 7 Marcus MW, de Vries MM, Junoy Montolio FG, Jansonius NM. Myopia as a risk factor for open-angle glaucoma: a systematic review and meta-analysis. *Ophthalmology* 2011;118(10):1989-94 e2.
- 8 Younan C, Mitchell P, Cumming RG, Rochtchina E, Wang JJ. Myopia and incident cataract and cataract surgery: the Blue Mountains Eye Study. *Invest Ophthalmol Vis Sci* 2002;43(12):3625-32.
- 9 Flitcroft DI. The complex interactions of retinal, optical and environmental factors in myopia aetiology. *Prog Retin Eye Res* 2012;31(6):622-60.
- 10 Ohno-Matsui K, Kawasaki R, Jonas JB, Cheung CM, Saw SM, Verhoeven VJ, et al. International photographic classification and grading system for myopic maculopathy. *Am J Ophthalmol* 2015;159(5):877-83 e7.
- 11 Zhu Y, Zhang T, Xu G, Peng L. Anti-vascular endothelial growth factor for choroidal neovascularisation in people with pathological myopia. *Cochrane Database of Systematic Reviews*. 2016(12).



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Cochrane Eyes and Vision: systematic reviews on myopia



Systematic reviews offer high quality, evidence-based guidance to health professionals. These reviews address myopia and its complications.

Cochrane Eyes and Vision (CEV) is an international network of individuals working to prepare, maintain and promote access to systematic reviews of interventions to treat or prevent eye diseases or visual impairment, and reviews of the accuracy of diagnostic tests. Systematic reviews are summaries of the best available evidence and are designed to answer a specific research question. The reviews featured here are published in the Cochrane Library, which is available free of charge in low- and middle-income countries via the Hinari Programme. www.who.int/hinari

1 Interventions to slow progression of myopia in children

www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD004916.pub3

Date: December 2011. Update due in 2019.

Key findings: Anti-muscarinic topical medication slows the progression of myopia in children. Adverse effects include light sensitivity and near blur.

2 Vision screening for correctable visual acuity deficits in school-age children and adolescents

www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD005023.pub3

Date: February 2018

Key findings: Vision screening plus provision of free spectacles improves the number of children who have and wear the spectacles they need compared with providing a prescription only.



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Providing free spectacles improves the number of children who have and wear their spectacles. PAKISTAN

3 Laser photocoagulation for choroidal neovascularisation in pathologic myopia

www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD004765.pub2/

Date: March 2007

Key findings: The effect of laser photocoagulation to treat choroidal neovascularisation due to myopia is uncertain. Adverse effects include enlargement of the atrophic laser scar which is potentially vision threatening.

4 Anti-vascular endothelial growth factor for choroidal neovascularisation in people with pathological myopia

www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD011160.pub2

Date: December 2016

Key findings: Low and moderate-certainty evidence that people receiving anti-vascular endothelial growth factor have a better outcome in terms of visual acuity compared with no treatment, photodynamic therapy or laser. Adverse effects occurred rarely.