

6 Areas requiring further research

This literature review covers a very large scope of eye disease and vision issues, and hence it was not possible to search each issue in detail. Also, because the search was from 1996–2006 only, some established relationships, published before 1996, have not been shown in this review. This chapter discusses areas that would benefit from further, more focused analysis of the literature.⁴

Smoking and age-related macular degeneration

Although the literature review reported here did not find information about age-related macular degeneration (AMD) and heredity, searches using broader key words, such as ‘genetics’ and ‘genetic mutations’, reveal studies on the contribution of specific genetic mutations to the susceptibility of individuals to smoking.

A recent study demonstrated that a particular genetic susceptibility (LOC387715), combined with smoking, confers a significantly higher risk of AMD than either factor alone (Schmidt et al 2006). This is consistent with reports from family aggregation studies, which suggest that a first-degree relative of an individual with AMD is five times more likely to develop AMD than a family member of someone without the condition (Mullins 2007). Further research into the genetic component of AMD is underway. As the disease pathway becomes better understood, it may be possible to treat the disease in new ways (Mullins 2007).

Although it would be possible to test for increased susceptibility, a general anti-smoking message for AMD is probably most appropriate.

UV light and sunlight

This topic touches on several issues that may be suitable for further review.

Light exposure is a risk factor for cataract, but may also be a protective factor for myopia (Jones et al 2007). Australian life expectancy has reached the point where most people will eventually need a cataract operation; therefore, it is not clear whether limiting UV exposure will protect against cataract or will merely delay the need for surgery. This raises the important issue of what amount of light exposure is optimal for eye health.

Finally, if sunglasses are worn (especially by children as part of school sunsmart policies), protection against light exposure needs to be balanced against potential for physical damage if the glasses are broken.

Heredity (also see notes on smoking and AMD, and on myopia)

Heredity is a complex issue, often overwhelmed by confounding factors. Some eye diseases are mostly genetic in origin (eg retinitis pigmentosa); whereas others appear to be mostly environmental (eg some forms of myopia). Thus, the influence of heredity

⁴ With thanks to Dr Ian Morgan and Dr Kathryn Rose (see Appendix 1) for providing comments on the literature review and helpful suggestions for areas that would benefit from more focused analysis.

depends on the eye disease being studied. Also, environmental exposures can interact with genetic susceptibility, as happens in AMD.

A more focused review of this area may help to develop the most appropriate public health messages on heredity and eye disease.

Diet (including nutritional supplements and fatty acids)

The effect of diet on eye disease is a complex issue — many dietary components and supplements have been tested in different combinations, with conflicting data.

A focused review of this area alone, with detailed biostatistical analysis of the studies, may identify the reasons for the conflicting data and provide more useful information to underpin public health messages.

Eye infections

Orthokeratology (the use of hard contact lenses to reshape the eye) is increasingly being used to treat mild myopia. However, there are some emerging concerns about infection with this treatment (see Appendix 4, summary table 229). The recent increase in popularity of this treatment has led to cases of bacterial keratitis and corneal ulcers. Most of these cases occurred in Asian countries, where myopia is more common, but a few have been reported in Australia. These risks may be comparable to the use of hard contact lenses in general, but further research is needed (Kwok et al 2005).

In East Asia, orthokeratology has recently become popular for children, due to advertising claims that the procedure will halt or hinder the progression of myopia (Kwok et al 2005). This hypothesis has not been studied. Given that the primary effect of orthokeratology is temporary, a long-term reduction in myopia may be unlikely. Research is needed to better understand the possible risks, benefits, mechanisms and long-term effects of orthokeratology.

Ocular hypertension and glaucoma

The link between high ocular hypertension (OHT) and glaucoma is problematic. OHT is a known risk factor for glaucoma, but it is possible that most glaucoma occurs without OHT. For example, a population-based study in Tajima, Japan, found that 92% of diagnosed glaucoma occurred in people with normal intraocular pressure (Suzuki et al 2006).

Using OHT to screen for glaucoma could lead to a problem of circularity. That is, if OHT is used to screen for glaucoma, then studies on people with glaucoma will find it is associated with OHT.

Further investigation into the incidence and causes of the disease would be useful, perhaps with less emphasis on OHT.

Socioeconomic status

Socioeconomic status is linked to education and the ability to access services. As a result, groups with low socioeconomic status are more likely to have eye problems (eg poorly corrected refractive error). This is an important issue, affecting many eye diseases. Further focused research in this area could cover the link between eye health and socioeconomic status in more detail. Ethnicity may be an important factor to consider.

Refractive errors

High myopia and cataract (also blindness and retinal degeneration)

Myopic eyes have a higher prevalence of cataract, glaucoma and retinal detachment. High myopia is a risk factor for two potentially blinding conditions — retinal detachment and chorioretinal degenerations — which were not included in this review.

When the prevalence of high myopia is high, myopia can be a major cause of blindness (Vongphanit et al 2002). This is the case in Singapore, where the prevalence of myopia is 20% in young adults (Morgan et al 2005). If Australia develops the high rates of myopia seen in East Asia, this could become a major health problem. A further review of this area might outline the scope of the problem, and determine what measures could be effective against the problem.

Age and ageing, and myopia

The age at which myopia occurs is dependent on the type of myopia, which in turn appears to be strongly linked to location. Myopia in Nepal is mostly genetic, and hence occurs at a young age, with later development quite rare. In contrast, about 90% of myopia in Singapore appears to be environmental (Morgan et al 2005). In Australia, myopia appears to be mostly environmental, so it usually occurs at an older age.

The development of myopia later in life appears to be strongly associated with cataract, but the mechanism for this is unclear.

Further research is needed before clear public health messages can be developed.

Diet and myopia

The effect of diet on myopia is a complex issue, partly because of conflicting data. One of the largest studies on this topic, done in Israel, found that myopia was linked with smaller body size (Rosner et al 1995). An unpublished thesis suggests that myopia should be treated as a surrogate for education, and height or diet as a surrogate for socioeconomic status. Where education and good diet are connected, myopes may be taller. However, where they are disconnected — as in Israel, where Orthodox Jews are highly myopic but have relatively limited diets and engage in little outdoor activity — the relationship can be reversed. These findings suggest that the link between diet and myopia is highly indirect, but further review might help to establish how the two are related.

Diabetic retinopathy

Determining which diabetic patients are at risk of diabetic retinopathy and targeting these patients for intensive therapy is an important goal of management of type 2 diabetes. It is important to determine the relationship between onset of diabetes, age, and incidence of

the disease. This literature review found conflicting results. More primary research may be required to elucidate this issue; however, a more focused review of this area may reveal further useful information.

Eye testing

At present, this area is poorly studied. This review examined whether regular eye tests have an effect on the incidence of eye disease.

A more relevant question for further review may be whether regular eye tests enable earlier identification or more effective treatment. Further primary studies of the effectiveness (and cost-effectiveness) of population screening would be more helpful, taking into account the amount of undiagnosed disease in the population (eg for amblyopia or glaucoma), and the effectiveness of treatment.