

Editorial

Visual impairment and mortality: Are they related?



In this issue of the Journal of the Chinese Medical Association, we have included an article from the Shihpai Eye Study. Therein, Kuang et al¹ reported the relationship between visual impairment and 3-year mortality among older people in the Shihpai area in the city of Taipei. The association between visual impairment and mortality has been extensively studied over a lengthy period of time. The Beaver Dam Eye Study at Beaver Dam, WI, USA reported that poorer survival was associated with more severe cataracts and visual impairment in 1995.² A later follow-up study showed that cataracts, diabetic retinopathy, and visual impairment were associated with poorer survival during a 14-year period in 2006.³ The Salisbury Eye Evaluation Project in Salisbury, MD, USA described how worse baseline acuity was associated with a higher mortality rate in a prospective 8-year cohort in 2005.⁴ They reported a similar association in 2014, and also observed that a decline in visual acuity over time was associated with increased mortality risk.⁵ The Blue Mountains Eye Study in Sydney, Australia reported that age-related cataracts and visual impairment were associated with increased mortality in older people in 2001,⁶ and then described the association between cataracts and age-related macular degeneration with higher mortality rate, although the association with visual impairment could not be verified in 2007.⁷ In 2009, they reported that visual impairment predicted mortality in a 13-year period.⁸ These long-term epidemiological studies have shown an association between visual impairment and increased mortality, with a variety of possible mechanisms.

1. Age, the major risk factor for death

Age is the most important and powerful determinant of mortality in humans. Most of the referenced epidemiological studies have adjusted a variety of confounding factors, including age. Nevertheless, visual impairment seems to remain significantly associated with higher mortality even after adjusting for age. There are a number of age-related eye diseases, such as cataracts, glaucoma, and age-related macular degeneration. The prevalence and severity of these eye diseases usually increase with age, although possibly at different speeds. They may represent a biological marker for aging, and coexist with those changes associated with aging in other vital organs such as the heart or brain, which are important life span factors.

2. Systemic disease involving the eye and vital organs

Diabetes mellitus is a typical systemic disease affecting both the eye and multiple vital organs. In a population-based study with a type 1 diabetic patient cohort, poor control of blood sugar was found to be associated with diabetic retinopathy severity and blindness.⁹ In this study, it was found that mortality was higher in patients who had become blind in a 25-year period. This association may reflect the clinical manifestation of the same disease process in the eye and other vital organs, which results in blindness and death, respectively.

3. Visual impairment may lead to more accidents

Visual impairment may be associated with an increased likelihood of accidents, with falls being the most noticeable event.^{10,11} The risk factors for falls include aging, gait disorder, postural stability, neurological and cardiovascular disorders, medications, environmental factors, and visual impairment.¹⁰ Visual input is important for a person to maintain balance and prevent falls. Various changes in visual characters such as far vision, near vision, visual field, binocular vision, and stereopsis may increase the risk of falls. Visual impairment may result in an increased likelihood of falls,^{10,11} with potentially serious consequences such as hip fracture. More importantly, falls are known to be a leading cause of mortality among older people.^{10,11} The Shihpai Eye Study has included the history of falls as a risk factor for mortality in their analysis.

4. Visual impairment may cause psychological change

Visual impairment may cause a variety of psychological changes such as social isolation, cognitive impairment, and depression.¹² Zheng et al¹² studied the role of mental wellbeing on the mortality rate among visually impaired people. They found that visual impairment adversely affected mental wellbeing in adults. Furthermore, it may increase the mortality risk indirectly through its adverse impact on mental wellbeing. In the Salisbury Eye Evaluation Project, they also investigated this question using a questionnaire [General Health Questionnaire (GHQ-28)] to evaluate depressive symptoms.⁴ Although they confirmed the association between poor visual acuity and higher mortality rate, depressive symptoms

were not the mediators in these associations.⁴ The Shihpai Eye Study also addresses this point using the Geriatric Depression Scale-Short Form (GDS-S) to evaluate the extent of depression present in Taiwan's older population.¹

5. Visual impairment may decrease daily functional status

For any patient, worse vision may cause daily activities to become increasingly difficult; it has been shown that functional status is correlated with patient mortality rate. The functional status of daily activity was assessed in two categories: (1) activities of daily living (ADL), such as bathing, dressing, eating—essentially those fundamental functions in daily life; and (2) instrumental ADL (IADL), such as telephone use, shopping, and housework—those functions necessary for an individual to live independently in the community.⁵ Previous studies have shown that visual impairment was associated with an increased risk of mortality indirectly through the associated declines in IADL levels, but not in ADL levels.^{5,13}

6. If patient vision is somehow improved, will the mortality risk decrease accordingly?

In the Salisbury Eye Evaluation Project in 2005, researchers found that women who lost three lines of visual acuity over a 2-year period had an elevated risk of mortality.⁴ By contrast, those people who recovered two or more lines of visual acuity over 2 years had a lower risk of mortality.⁴ In the Blue Mountains Eye Study in 2013,¹⁴ participants who had both cataracts and visual impairment were compared with those who had undergone cataract surgery at 5- and 10-year follow ups. After adjusting for age, sex, and a number of other covariates, participants who received cataract surgery and no longer had visual impairment had significantly lower long-term mortality risk than those who had not undergone cataract surgery.¹⁴ Thus, surgical correction of cataract-induced visual impairment in older persons may help not only to improve their quality of life, but also to increase long-term survival. The manifest strength of the Shihpai Eye Study is that it is a population-based, large-scale prospective study. Most importantly, it has included a comprehensive set of risk variables such as depression and falls for risk adjustment.¹

Conflicts of interest

The author declares that there are no conflicts of interest related to the subject matter or materials discussed in this article.

References

1. Kuang TM, Tsai SY, Liu CJL, Lee SM, Hsu WM, Chou P. The association of visual impairment and 3-year mortality among the elderly in Taiwan: The Shihpai Eye Study. *J Chin Med Assoc* 2015;**78**:177–81.
2. Klein R, Klein BE, Moss SE. Age-related eye disease and survival. The Beaver Dam Eye Study. *Arch Ophthalmol* 1995;**113**:333–9.
3. Knudtson MD, Klein BE, Klein R. Age-related eye disease, visual impairment, and survival: the Beaver Dam Eye Study. *Arch Ophthalmol* 2006;**124**:243–9.
4. Freeman EE, Egleston BL, West SK, Bandeen-Roche K, Rubin G. Visual acuity change and mortality in older adults. *Invest Ophthalmol Vis Sci* 2005;**46**:4040–5.
5. Christ SL, Zheng DD, Swenor BK, Lam BL, West SK, Tannenbaum SL, et al. Longitudinal relationships among visual acuity, daily functional status, and mortality: The Salisbury Eye Evaluation Study. *JAMA Ophthalmol* 2014. <http://dx.doi.org/10.1001/jamaophthalmol.2014.2847>.
6. Wang JJ, Mitchell P, Simpson JM, Cumming RG, Smith W. Visual impairment, age-related cataract, and mortality. *Arch Ophthalmol* 2001;**119**:1186–90.
7. Cugati S, Cumming RG, Smith W, Burlutsky G, Mitchell P, Wang JJ. Visual impairment, age-related macular degeneration, cataract, and long-term mortality: the Blue Mountains Eye Study. *Arch Ophthalmol* 2007;**125**:917–24.
8. Karpa MJ, Mitchell P, Beath K, Rochtchina E, Cumming RG, Wang JJ. Blue Mountains Eye Study. Direct and indirect effects of visual impairment on mortality risk in older persons. *Arch Ophthalmol* 2009;**127**:1347–53.
9. Grauslund J, Green A, Sjølie AK. Blindness in a 25-year follow-up of a population-based cohort of Danish type 1 diabetic patients. *Ophthalmology* 2009;**116**:2170–4.
10. Dhital A, Pey T, Stanford MR. Visual loss and falls: a review. *Eye (Lond)* 2010;**24**:1437–46.
11. Skalska A, Wizner B, Piotrowicz K, Klich-Rączka A, Klimek E, Mossakowska M, et al. The prevalence of falls and their relation to visual and hearing impairments among a nation-wide cohort of older Poles. *Exp Gerontol* 2013;**48**:140–6.
12. Zheng DD, Christ SL, Lam BL, Arheart KL, Galor A, Lee DJ. Increased mortality risk among the visually impaired: the roles of mental well-being and preventive care practices. *Invest Ophthalmol Vis Sci* 2012;**53**:2685–92.
13. Zheng DD, Christ SL, Lam BL, Tannenbaum SL, Bokman CL, Arheart KL, et al. Visual acuity and increased mortality: the role of allostatic load and functional status. *Invest Ophthalmol Vis Sci* 2014;**55**:5144–50.
14. Fong CS, Mitchell P, Rochtchina E, Teber ET, Hong T, Wang JJ. Correction of visual impairment by cataract surgery and improved survival in older persons: the Blue Mountains Eye Study cohort. *Ophthalmology* 2013;**120**:1720–7.

An-Guor Wang*

Department of Ophthalmology, Taipei Veterans General Hospital, National Yang-Ming University School of Medicine and School of Life Science, Taipei, Taiwan, ROC

*Corresponding author. Dr. An-Guor Wang, Department of Ophthalmology, Taipei Veterans General Hospital, 201, Section 2, Shih-Pai Road, Taipei 112, Taiwan, ROC. E-mail address: agwang@vghtpe.gov.tw (A.-G. Wang).