Impact of unilateral and bilateral vision loss on quality of life

H T V Vu, J E Keeffe, C A McCarty, H R Taylor

Aim: To investigate whether unilateral vision loss reduced any aspects of quality of life in comparison with normal vision and to compare its impact with that of bilateral vision loss.

Methods: This study used cluster stratified random sample of 3271 urban participants recruited between 1992 and 1994 for the Melbourne Visual Impairment Project. All predictors and outcomes were from the 5 year follow up examinations conducted in 1997–9.

Results: There were 2530 participants who attended the follow up survey and had measurement of presenting visual acuity. Both unilateral and bilateral vision loss were significantly associated with increased odds of having problems in visual functions including reading the telephone book, newspaper, watching television, and seeing faces. Non-correctable by refraction unilateral vision loss increased the odds of falling away from home (OR = 2.86, 95% CI 1.16 to 7.08), getting help with chores (OR = 3.09, 95% CI 1.40 to 6.83), and becoming dependent (getting help with meals and chores) (OR = 7.50, 95% CI 1.97 to 28.6). Non-correctable bilateral visual loss was associated with many activities of daily living except falling.

Conclusions: Non-correctable unilateral vision loss was associated with issues of safety and independent living while non-correctable bilateral vision loss was associated with nursing home placement, emotional wellbeing, use of community services, and activities of daily living. Correctable or treatable vision loss should be detected and attended to.

METHODS

The detailed methodology for the baseline Melbourne VIP, a population based study of Melbourne adults, has been published previously. Briefly, nine pairs of census collector districts were randomly selected from the Melbourne Statistical Division. A household census was conducted to identify eligible residents who were aged 40 years and older and had been resident in their homes for at least 6 months. Eligible residents were then invited to local examination centres for a standard ophthalmic examination and completion of an extensive eye health related questionnaire. The protocol was approved by the human research and ethics committee of the Royal Victorian Eye and Ear Hospital, and all participants gave written, informed consent.

All participants who were still alive and could be contacted from the baseline survey were invited to participate in the 5 year follow up study. This paper used data from the follow up study.

The standard ophthalmic examination included measurement of presenting (usual or “walking around”) visual acuity from a logMAR chart, and visual field assessment using the Humphrey field analyser (Humphrey Instruments Inc) with 24–2 Fastpac statistical package. Best corrected visual acuity was measured after refraction for those with visual acuity less than 6/6. An eye had visual field loss if its visual field was classified as either homonymous hemianopia or having constriction of less than 20 radii of fixation. Vision loss was defined as either visual field loss or presenting visual acuity of less than 6/12. Vision loss in an eye was correctable if the eye had presenting visual acuity of <6/12, no visual field loss, and best corrected visual acuity of ≥6/12. Moderate to severe non-correctable vision loss was defined as either best corrected visual acuity of less than 6/24 or having visual field constriction of less than 10 radii of fixation. Thus, we considered correctable or non-correctable bilateral vision loss, and correctable, non-correctable, or moderate to severe
non-correctable unilateral vision loss. The vision predictors were the variables indicating normal vision and one of the above five vision loss categories. In most cases these predictors had two levels: normal vision versus vision loss. However, we also divided non-correctable unilateral vision loss into two subcategories depending on whether the better eye had best corrected visual acuity of less than 6/7.5, and the corresponding vision predictor had three instead of two levels. Other predictors included age, sex, country of birth, smoking, duration of high blood pressure, arthritis, diabetes, gout, and cardiovascular disease (table 1). We examined 15 different outcomes obtained from the follow up survey from the best selected multivariate models by the backward stepwise regression method, where the initial models included 10 predictors obtained from the follow up survey for each outcome (table 1)—that is, we deleted the least significant factors other than age, sex, and vision loss until the p values for the tests of whether they were different from zero were less than 0.05.

RESULTS
There were 3040 (93%) participants who were still alive out of 3271 participants in the baseline survey. Of 3040 remaining participants, 2594 (85%) attended the follow up survey. Participation was not significantly related to visual outcomes such as decreased visual acuity, cataract, or glaucoma. In addition, it was not significantly related to sex even at the univariate level, and the p value was only 0.04 for age in the multivariate level. The only factors other than age related to participation was country of birth and language.

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**Table 1** Participants’ characteristics

<table>
<thead>
<tr>
<th>Risk factor (n*)</th>
<th>Frequency (%)</th>
<th>Risk factor (n*)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (2530)</td>
<td></td>
<td>Country of birth (2529)</td>
<td></td>
</tr>
<tr>
<td>40–49</td>
<td>322 (12.7)</td>
<td>Australia/New Zealand</td>
<td>1468 (58.1)</td>
</tr>
<tr>
<td>50–59</td>
<td>763 (30.2)</td>
<td>British Isles</td>
<td>259 (10.2)</td>
</tr>
<tr>
<td>60–69</td>
<td>772 (30.5)</td>
<td>Greece/Cyprus/Malta</td>
<td>180 (7.1)</td>
</tr>
<tr>
<td>70–79</td>
<td>497 (19.6)</td>
<td>Italy</td>
<td>241 (9.5)</td>
</tr>
<tr>
<td>80+</td>
<td>176 (7.0)</td>
<td>Other</td>
<td>381 (15.1)</td>
</tr>
<tr>
<td>Female (2530)</td>
<td>1383 (54.7)</td>
<td>Duration of high blood pressure (2352)</td>
<td></td>
</tr>
<tr>
<td>Vision category (2530)</td>
<td></td>
<td>None</td>
<td>1478 (62.8)</td>
</tr>
<tr>
<td>Bilateral vision loss</td>
<td>159 (6.3)</td>
<td>&lt;5 years</td>
<td>249 (10.6)</td>
</tr>
<tr>
<td>Unilateral vision loss</td>
<td>302 (11.9)</td>
<td>6–10 years</td>
<td>189 (8.0)</td>
</tr>
<tr>
<td>Normal vision</td>
<td>2069 (81.8)</td>
<td>&gt;10 years</td>
<td>436 (18.5)</td>
</tr>
<tr>
<td>Smoking (2332)</td>
<td></td>
<td>Arthritis (2338)</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1140 (48.9)</td>
<td>Diabetes (2413)</td>
<td></td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>891 (38.2)</td>
<td>Gout (2331)</td>
<td>228 (9.8)</td>
</tr>
<tr>
<td>Current</td>
<td>301 (12.9)</td>
<td>Cardiovascular disease (2323)</td>
<td>298 (12.8)</td>
</tr>
</tbody>
</table>

* indicates that the total number of complete data records for that variable.

**Table 2** Frequencies of outcomes from the follow up survey for normal vision, unilateral, or bilateral loss

<table>
<thead>
<tr>
<th>Outcome description</th>
<th>Normal vision loss</th>
<th>Unilateral vision loss</th>
<th>Bilateral vision loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fell at home in the past month</td>
<td>63/1913 (3.29%)</td>
<td>12/281 (4.27%)</td>
<td>7/132 (5.3%)</td>
</tr>
<tr>
<td>Fell when away from home in the past month</td>
<td>40/1913 (2.09%)</td>
<td>8/281 (2.85%)</td>
<td>3/132 (2.26%)</td>
</tr>
<tr>
<td>Ever fell in the past month</td>
<td>99/1913 (5.18%)</td>
<td>19/281 (6.76%)</td>
<td>10/132 (7.58%)</td>
</tr>
<tr>
<td>Having hip replacement surgery</td>
<td>32/1914 (1.67%)</td>
<td>10/281 (3.57%)</td>
<td>8/132 (6.09%)</td>
</tr>
<tr>
<td>Living in a hostel, aged care hostel, or nursing home</td>
<td>6/1925 (0.31%)</td>
<td>4/281 (1.28%)</td>
<td>12/137 (8.76%)</td>
</tr>
<tr>
<td>Using meals on wheels or supplied by relatives or friends more than once per week</td>
<td>17/1916 (0.89%)</td>
<td>10/281 (3.56%)</td>
<td>12/135 (8.89%)</td>
</tr>
<tr>
<td>Getting help with chores from council home help, relatives, or friends more than once per week</td>
<td>32/1916 (1.67%)</td>
<td>21/281 (7.47%)</td>
<td>15/135 (11.1%)</td>
</tr>
<tr>
<td>Dependency (getting help with meals and chores)</td>
<td>6/1916 (0.31%)</td>
<td>7/281 (2.49%)</td>
<td>8/135 (5.93%)</td>
</tr>
<tr>
<td>Health/Emotional problems interfered extremely with normal social activities in the past month</td>
<td>29/1938 (1.5%)</td>
<td>7/275 (2.55%)</td>
<td>9/123 (7.32%)</td>
</tr>
<tr>
<td>Did not feel full of life at all in the past month</td>
<td>76/1883 (4.04%)</td>
<td>10/268 (3.73%)</td>
<td>15/114 (13.2%)</td>
</tr>
<tr>
<td>Had problems reading the telephone book</td>
<td>359/1910 (18.8%)</td>
<td>77/278 (27.7%)</td>
<td>66/130 (50.8%)</td>
</tr>
<tr>
<td>Had problems reading newspaper</td>
<td>218/1910 (11.4%)</td>
<td>51/278 (18.3%)</td>
<td>52/131 (39.7%)</td>
</tr>
<tr>
<td>Had problems watching television</td>
<td>56/1914 (2.93%)</td>
<td>23/278 (8.27%)</td>
<td>35/134 (26.1%)</td>
</tr>
<tr>
<td>Had problems seeing faces</td>
<td>18/1914 (0.94%)</td>
<td>12/278 (4.32%)</td>
<td>24/134 (17.9%)</td>
</tr>
<tr>
<td>Had problems doing other activities</td>
<td>187/1914 (9.77%)</td>
<td>30/277 (10.8%)</td>
<td>19/134 (14.2%)</td>
</tr>
</tbody>
</table>
spoken at home, where non-English speakers and people born in Greece, Malta, or Cyprus were significantly less likely to participate. However, the rates of participation based on those who were still alive at the follow-up survey were 73% for non-English speakers, 84% for English speakers, 72% for people born in Greece, Malta, or Cyprus, and 79% for people born in other places. The effects of reduced best corrected visual acuity were 73% for people born in Greece, Malta, or Cyprus, and 79% for people who were still alive at the follow-up survey.

For example, only 137 (78%) of 159 participants with correctable unilateral vision loss with best corrected visual acuity of less than 6/7.5 in the better eye. It should be noted that non-correctable unilateral vision loss was associated with vision related activities, falling, and dependency issues. Non-correctable unilateral vision loss was significantly associated with any outcomes except those of visual functions (table 3). Moderate to severe non-correctable unilateral vision loss did not produce more significant results than non-correctable unilateral vision loss. Thus we carried out the multivariate analyses for only non-correctable unilateral and bilateral vision loss. Non-correctable vision loss remained significant or insignificant in the best selected multivariate models as they were in the corresponding univariate models for all outcomes, and the magnitudes of the odds ratios from the best selected multivariate models were essentially the same as those from the univariate models.

We presented the univariate and multivariate odds of vision loss versus normal vision (tables 3 and 4). Non-correctable unilateral vision loss was associated with vision related activities, falling, and dependency issues. Non-correctable unilateral vision loss with best corrected visual...
acuity of less than 6/7.5 in the better eye increased the odds of having health/emotional problems in comparison with normal vision (univariate OR = 4.94, 95% CI 1.13 to 21.6). On the other hand, non-correctable bilateral visual loss was not associated with falling, but it was associated with dependency, nursing home placement, emotional wellbeing, and visual tasks. Non-correctable unilateral visual loss gave a twofold to fivefold increase in the odds of having problems in reading the telephone book, reading the newspaper, watching television, and seeing faces. Non-correctable bilateral vision loss gave a sixfold to 41-fold increase in the odds of having these problems.

**DISCUSSION**

Even non-correctable unilateral vision loss had a measurable impact on falling and some other activities of independent living, although its impact was less than that of bilateral vision loss. Both non-correctable unilateral and bilateral vision loss was significantly associated with increased odds of having problems in many activities of daily life.

Non-correctable unilateral vision loss was associated with increased odds of falling when away from home although not of having hip replacement surgery. On the other hand, the falls in those with bilateral vision loss may result in more severe consequences such as death or having hip replacement surgery. Thus, of those who fell, those with bilateral vision loss were less likely to attend the survey than those with unilateral vision loss. This may explain why we could not detect significant association between falling and non-correctable bilateral vision loss in our study.

The univariate odds ratios showed no significant associations between correctable unilateral vision loss with any outcomes except those of visual functions. This conclusion agreed with that from the BMES. However, of those with unilateral vision loss, the level of severity in the worse eye did not really affect aspects of independent living in our study (table 3). On the contrary, those with moderate to severe non-correctable unilateral vision loss had significantly poorer general health scores than those with normal vision in the dimensions of “social functioning” and “role limitation due to emotional problems” while those with non-correctable unilateral vision loss did not in the BMES.

The study has a number of strengths, including its population based, prospective design, and its use of a comprehensive ophthalmological examination at each time point. Although multiple comparisons were made, they were explicitly stated, planned, and for the most part quite strong and consistent. The study had a number of limitations, including the possible selection biases as a result of loss of follow up, the cross sectional design, and each outcome had about 8% of missing data records. We concluded that non-correctable unilateral vision loss may cause some significant problems in activities dependent on vision including issues of safety and dependent living, and people with non-correctable unilateral vision loss may need assistance in these areas.

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**Authors’ affiliations**

H T V Vu, J E Keeffe, H R Taylor, Centre for Eye Research Australia, University of Melbourne, 32 Gisborne Street, East Melbourne, Vic 3002, Australia

C A McCarty, Marshfield Clinic Research Foundation, 1000 North Oak Avenue (ML1), Marshfield WI 54449, USA

Competing interests: None declared.

Ethical approval: The protocol was approved by the Human Research and Ethics Committee of the Royal Victorian Eye and Ear Hospital.

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