Impaired vision in the elderly: a preventable condition
YT Wun, CC Lam* and WK Shum*


Background. Vision is thought to deteriorate with age as a number of factors in later life endanger eyesight. Assessment of the visual acuity of the elderly and identification of endangering factors help in detecting those with impaired vision which in turn impairs daily activities.

Objective. This study measured the visual acuity of the senior citizens and identified those with impaired vision. The probable contributing factors for impaired vision were studied with the aim of preventing visual impairment.

Method. The study was part of a screening campaign for elderly glaucoma in the community. A convenience sample of ambulatory senior citizens from stratified localities had their visual acuity measured with a standard Snellen’s chart. The test was repeated with pinholes if the visual acuity was less than 0.5. Those without improvement after pinhole were considered as having impaired vision. People with elevated intraocular pressure by the Pulsair were selected for examination by an ophthalmologist for ocular pathology.

Results. For the ambulatory population aged ≥65 the mean visual acuity of either eye before pinhole was 0.3. Nearly 72% had impaired vision (visual acuity not corrected above 0.5 with pinhole). There was a significant association between this impairment and female sex, history of diabetes mellitus or glaucoma, cataract, and infrequent eye examination.

Conclusion. Impaired vision is highly prevalent in the elderly ambulatory population, a condition which is preventable by tight surveillance of predisposing factors and regular simple measurement of visual acuity. The primary care setting is most suitable for these activities.

Keywords. Elderly, general practice, impaired vision, vision screening, visual acuity.

Introduction

Vision may deteriorate as age advances due to various age-related diseases, e.g. macular degeneration, senile cataracts and presbyopia. Impaired vision also impairs daily life, predisposing the elderly to falls, depression, and difficulty in taking medication. There are few studies on the visual acuity (VA) in the elderly. The age groups in these studies are variable, ranging from 40 years of age to above 80. The Framingham Eye Study found a VA of ≥0.8 in the better eye in >90% of those aged 52–74 but only in 69% for those aged 75–85. Bergman et al. also found a VA >0.8 in 54% of the ambulatory elderly aged above 82 years. Hirvela et al. reported a mean VA of 0.7 in the better eye of those aged >70 while Rouhiainen et al. found a VA of <0.3 in the better eye in 5.5% of the older group of those aged ≥65. These observations appear to suggest that the elderly may have satisfactory visual ability.

On the other hand, some 47.7% of an urban elderly population aged ≥80 years reported impaired vision. Wang et al. found that 20% of those aged ≥40 had the best corrected VA <0.5 in at least one eye and 5% in both eyes. Is impaired vision common and what is the expected VA in the elderly?

Senile cataracts and the consequent impaired vision are treatable. Some diseases, notably diabetes mellitus, hypertension and glaucoma, are more prevalent in the ageing population and may impair vision. These complications are preventable by tight disease control and regular surveillance. Thus impaired vision in many older
people may be either preventable or treatable. It is more important to know these factors and the proportion of this avoidable impairment than the prevalence of impaired vision alone.

This study aimed to measure the prevalence of impaired vision in the elderly and describe its relationship with predisposing factors, with a view to preventing its occurrence.

**Methods**

This study was undertaken as part of a community-based screening programme for glaucoma in the elderly. During the latter half of 1995, teams of nurses, paramedical staff, technicians and doctors from the Evangel Hospital visited 16 communities in Hong Kong. The communities were chosen to include a stratified sample of densely populated districts. The public was informed of the free screening service by posters in the local community, and through invitations to local social groups or centres for the elderly. All people aged 50 or above were welcome to participate.

Screening was performed at exhibition stalls in local, popular and easily accessible community sites. A short questionnaire was completed with the help of staff. VA was tested with a standard Snellen’s chart at 6 m under good lighting conditions by nurses or paramedical technicians who had received training before the screening. The test was repeated with pinholes if the VA of either eye was 0.5 or worse. Non-contact tonometry with Pulsair was then used to measure the intraocular pressure (IOP). Those with IOP >22 mmHg were examined by the ophthalmologist (WKs) at a later date.

For this study ‘impaired vision’ was defined as VA worse than 0.5 in either eye, not improved by pinhole. Statistical tests were performed using the χ² test and P values of ≤0.05 were taken as significant.

**Results**

A total of 3986 senior citizens aged 50 or above were recruited in the study; 2599 (65.2%) were aged 65 years or above. The male to female ratio was 1:3 and the mean age was 67.6 years (SD 8.2 years).

**Table 1 Visual acuity and occurrence of impaired vision**

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Average VA (before pinhole)</th>
<th>Study sample</th>
<th>Unilateral impaired vision</th>
<th>Bilateral impaired vision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right eye</td>
<td>Left eye</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50–59</td>
<td>0.4</td>
<td>0.4</td>
<td>671</td>
<td>176</td>
</tr>
<tr>
<td>60–69</td>
<td>0.4</td>
<td>0.4</td>
<td>1684</td>
<td>921</td>
</tr>
<tr>
<td>70–79</td>
<td>0.3</td>
<td>0.3</td>
<td>1309</td>
<td>986</td>
</tr>
<tr>
<td>≥ 80</td>
<td>0.2</td>
<td>0.2</td>
<td>322</td>
<td>294</td>
</tr>
<tr>
<td>Total</td>
<td>0.4</td>
<td>0.4</td>
<td>3986</td>
<td>2377</td>
</tr>
</tbody>
</table>

**Impaired vision in the study sample**

The average VA in either eye of our study sample was 0.4. Nearly 60% of all aged 50 years or above had impaired vision. The occurrence of unilateral or bilateral impaired vision was significantly related to age (P < 0.001, Table 1). It was also significantly related to a past history of cataract, diabetes mellitus and family history of glaucoma (all P < 0.001, Table 2). In the whole study sample, males enjoyed better VA (Table 3), probably due to a higher proportion of females with cataracts (750 of 2946 females versus 177 of 1005 males, P < 0.001).

There were 3229 valid answers to the question ‘Have you attended an ophthalmologist within the past 2 years?’ Of these, 1234 (38%) had done so for various reasons. Significantly more people without eye consultations suffered from impaired vision (P < 0.001, Table 4).

**Table 2 Impaired vision and significant past medical history**

<table>
<thead>
<tr>
<th>History</th>
<th>Whole sample</th>
<th>Unilateral impaired vision</th>
<th>Bilateral impaired vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>927</td>
<td>710</td>
<td>395</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>489</td>
<td>326</td>
<td>235</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1201</td>
<td>734</td>
<td>503</td>
</tr>
<tr>
<td>Myopia</td>
<td>721</td>
<td>425</td>
<td>292</td>
</tr>
<tr>
<td>Family history of glaucoma</td>
<td>76</td>
<td>63</td>
<td>38</td>
</tr>
</tbody>
</table>

**Table 3 Sex and occurrence of impaired vision**

<table>
<thead>
<tr>
<th>Impaired vision</th>
<th>Female</th>
<th>Male</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>No impaired vision</td>
<td>1157</td>
<td>452</td>
<td>-</td>
</tr>
<tr>
<td>Unilateral</td>
<td>1817</td>
<td>560</td>
<td>0.001</td>
</tr>
<tr>
<td>Bilateral</td>
<td>1314</td>
<td>363</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 4 Impaired vision and eye consultation**

<table>
<thead>
<tr>
<th>Eye consultation</th>
<th>Unilateral impaired vision</th>
<th>Bilateral impaired vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>828</td>
<td>581</td>
</tr>
<tr>
<td>No</td>
<td>1100</td>
<td>774</td>
</tr>
</tbody>
</table>
The ophthalmologist examined 756 subjects who were suspected to have elevated intraocular pressure (IOP). Among these, 373 met our definition of impaired vision in either eye. Most of them, (250/373; 67.0%), had cataracts and 242 (64.9%) had bilateral cataracts, but only 58 of these 250 people (23.2%) were aware of their cataracts.

**Impaired vision in the elderly**

We defined elderly as those aged ≥65. There were 1909 females and 690 males (male:female ratio 1:2.8) in this category. The average VA for either eye before pinhole was 0.3. Among these 2599 subjects, 1862 (71.6%) had impaired vision. This was significantly more common in females (Table 5, P < 0.001). For either eye of those without impairment, the VA was 0.4 before pinhole but 0.5 after pinhole. For those with impaired vision, the VA was 0.3 before and after pinhole. In addition to gender, there was a significant association between impaired vision and known history of glaucoma (P < 0.01), diabetes mellitus (P = 0.02), cataract (P < 0.001) and previous eye consultation (P < 0.001).

**Visual acuity in diabetic patients**

Since diabetes mellitus (DM) causes various eye complications with consequent impaired vision, those known to have diabetes were further analysed. The mean age of 489 persons with DM was 68 (SD = 7.4) years and male:female ratio was 1:3 (124:365). Of these 4899 people, 146 also had a history of cataracts, 232 of hypertension, 73 of myopia, and 15 a family history of glaucoma. DM patients had significantly more cataracts (P = 0.002) and hypertension (P < 0.001) than non-diabetics. They had also significantly more impaired vision in one eye (P < 0.001) though they were not more prone to bilateral impaired vision (Table 6). However, only 161 (33%) had consulted an ophthalmologist within past 2 years; significantly fewer than the non-diabetic population (P = 0.028).

**Discussion**

There is no consensus definition for impaired vision, unlike blindness. It is difficult to define it and answers to two questions are important: what degree of impairment will limit activities necessary for daily function?, and should the better eye or worse eye be used for this definition? Little research has been undertaken on the first question, partly because it is difficult to quantify activities necessary for daily function. Bergman et al. suggested distance VA as a predictor of visual ability and disability. According to them, hobbies and household work were less dependent on vision, but everyday activities required a VA of 0.4–0.5. It is reasonable to take 'impaired vision' as a VA below half of the normal, i.e. <0.5. Most studies on human vision take the VA of the better eye. This approach measures the maximum capability of the individual but does not necessarily reflect the disability. Humans are binocular and spatial discrimination is important for vision. A person may have a completely blind eye (e.g. secondary to acute glaucoma) but retain acceptable VA in the other eye: VA in the better eye cannot in such circumstances reflect the disability. For these reasons, it is appropriate to define impaired vision as VA worse than 0.5 in either eye, not necessarily the better one; and our work is based on this definition, which Wang et al. also used.

Our study showed that about 60% of those aged ≥50 and 72% of those aged ≥65 had impaired vision in either eye. The observation worthy of concern is the average VA of 0.4 in either eye (0.3 in the elderly), which means that those with impaired vision have much worse VA and that assessing the better eye may not reflect the disability.

Most studies observe that the prevalence of impaired vision (on the better eye) is directly related to age but not sex. One study found significant association between visual impairment and glaucoma, insulin-dependent diabetes, history of cataract and lower income. Another study found no correlation between macular degeneration and hypertension, smoking or diabetes mellitus. This study found a significant association between visual impairment and the female sex, past history of DM or glaucoma, family history of glaucoma, and infrequent eye consultation. The association with gender is most likely due to the significant role of cataracts in females as shown also in the study by Dana et al. Another explanation could be related to different definitions of visual impairment.
Visual impairment secondary to DM or glaucoma is preventable. This study found that an association between DM and hypertension, cataracts, and impaired vision. The main reason for impairment in these at-risk groups is generally inadequate ophthalmic consultation. Only 33% of the diabetic patients had been seen by an ophthalmologist within 2 years, and they sought eye care even less frequently than the non-diabetics. It is most unfortunate that this group of people who are particularly vulnerable to eye disease and in whom impaired vision is largely preventable have such a low rate of eye care. It should be stressed to these patients that an annual ophthalmic examination is extremely important.

The proportion of our patients who underwent ophthalmic examination was a selected group (elevated Pulsair readings for intraocular pressure) and may not give the true picture of causes for impaired vision. In spite of this bias, it reflects the significance of cataracts in impaired vision in the elderly (67% of those with impaired vision had cataracts). Cataracts have been shown to be an important cause of poor vision or blindness. Cataract surgery improves not only visual function but also physical function, but less than one-quarter of our seniors with cataracts were aware of their presence. Early detection and treatment of cataracts will help to protect the elderly population from impaired vision.

The fact that impaired vision in some elderly people is preventable is important as strategies may be designed to minimize the incidence. This study showed a consistent significant association between impaired vision and infrequent ophthalmic consultation. It is not practicable for the ophthalmologist to screen every elderly person every year or two, but the primary health care team is a suitable route for early detection of visual impairment. One-third of elderly subjects with impaired vision are unaware of their eye disease and a significant proportion of people with undiagnosed ocular disease in the community are regular users of general medical services. Primary care provides a good opportunity for screening serious eye diseases (cataracts, glaucoma, diabetic retinopathy, age-related macular degeneration). Such screening needs no special arrangement or extra workload for the practice. The VA test with Snellen’s chart is easy to do, inexpensive but efficient by itself. All patients aged ≥ 65 should have their VA test annually when seen by the primary care team for any cause. Those at higher risk (history of DM, cataract, family history of glaucoma) should undergo VA testing more frequently and should be recalled for the test if none has been performed within the previous year. Those with deteriorating VA warrant early referral to the ophthalmologist.

Conclusions
Impaired vision is prevalent in the ambulatory elderly population. Conditions associated with visual impairment are largely preventable, cataract probably being a significant cause. The primary care team, using the Snellen’s chart and pinhole, provides the best and most cost-effective opportunity for early detection of this impairment.

References